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ABSTRACT

Conducted to review the present status of computerized bibliographic centers in Canada and to report on the most effective means of promoting computerized library network development in that country, this study summary of the findings of seven substudies (1) describes the salient features of 20 Canadian and United States centers; (2) reviews major options relating to the development of a computerized national location service system, as well as technological and cost trends bearing on library and information services networking in Canada; (3) summarizes the principal findings and conclusions of three studies dealing with more general aspects of network management and with the funding of network related research and development in Canada; and (4) summarizes the report compiled from externally submitted briefs concerning the role of the National Library of Canada. (FM)

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Canadian Computerized Bibliographic Centre Study
Background paper

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1979-05-10

OVERVIEW OF COMPUTERIZED LIBRARY NETWORKING IN CANADA

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Networks Office

National Library of Canada / Bibliothèque nationale du Canada
Ottawa
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D : Glossary

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The study team received help, advice, suggestions and information from so many organizations and individuals that the acknowledgements below are necessarily less than comprehensive.

Initiation, design and conduct of the overall study

The study was initiated in response to the recommendations of a national seminar attended by the delegates from 19 organizations listed on page 1 of Appendix A. In addition to these organizations, certain individuals contributed directly to the design of the study. Substudy B2 identifies the principal federal and provincial agencies concerned with library networking in Canada, and their mandates; this substudy was directly prompted by suggestions made by M. J-R. Brault, Conservateur en chef of the Bibliothèque nationale du Québec. Substudy A3, "Incompatibilities among on-line computerized bibliographic systems", was initiated on the direct and specific suggestion of Mr. E. Minett, Director, University of Toronto Library Automation Systems.

Other individuals who contributed directly to the design of the study include Mr. Basil Stuart-Stubbs (Chief Librarian, University of British Columbia and Chairman of the NLC Canadian Union Catalogue Task Group); Mr. Joe Forsyth, Library Development Officer, Alberta Culture; Mr. D. Meadows, Provincial Librarian, Saskatchewan; Dr. R. Blackburn, Chief Librarian, University of Toronto Library; Mr. D. Esplin, University of Toronto Library, M. R. Braithwaite, UTLAS; Dr. J. Brown, Director, Canada Institute for Scientific and Technical Information; M. Rosario de Varennes, Université de Laval; Mrs. Carin Somers, Provincial Librarian of Nova Scotia; Mrs. Mary Eileen Travis, Dartmouth Regional Library, N.S.; and the senior staff of the National Library of Canada.

Assistance in the design of the study, and information helpful to its completion, were also received from abroad. Organizations which were especially helpful include the British Library, England; the Library of Congress and the National Commission on Libraries and Information Science, USA; the Division de la cooperation et de l'automatisation (DICA) of the Service des bibliothèques, Secrétariat d'état aux universités, France; the Deutsche Bibliothek, West Germany; the Swedish Agency for Administrative Development and the Royal Library, Sweden; the Commission of the European Communities, D.G.XIII, Luxembourg; and the Department of Education and Science, England. Particular personal thanks are due to Henriette Avram, Library of Congress; Richard Coward and Maurice Line, British Library; and Björn Tell, Lunds Universitetsbibliotek, Sweden.

Within the National Library of Canada, staff closely involved with the conduct of the study included the National Librarian; the Associate National Librarian; the Branch Directors and the NLC Working Group on Library Networking made up of Assistant Director level representatives of NLC's Branches and the Federal Libraries Liaison Officer. In addition, the assistance of the NLC Library Documentation Centre is gratefully acknowledged.

Substudy A1 : Computerized bibliographic centres

Brian Silcoff was the principal investigator and was the author of the three more detailed volumes of the four-volume substudy report. The fourth summary volume was jointly authored by Roddy Duchesne and Brian Silcoff. Some preliminary work was done by Suzanne Richer. The cooperation and assistance of the 20 bibliographic centres listed in Table 1 is particularly appreciated.

Substudy A2 : National location service planning in an evolving Canadian computerized library network

Revett Eldred was the principal investigator, assisted by Flora Milne. An addendum to the report of the substudy was provided by Roddy Duchesne. Assistance received from the following organizations is gratefully acknowledged: National Library of Canada staff (particularly the DOBIS Project Team), Canada Institute for Scientific and Technical Information, the University of Toronto Library Automation Systems and the Library of Congress.

Substudy A3 : Incompatibilities among on-line computerized bibliographic systems

Revett Eldred was the principal investigator. The assistance of the ten organizations listed on page 25 is greatly appreciated. Flora Milne also made a substantial contribution to this substudy.

Substudy B1 : Funding for Canadian information and library network development

Doreen Guenter was the principal investigator, with substantial assistance provided by Roddy Duchesne. Preliminary work on the substudy was done by Claire Frigon and Suzanne Richer. The assistance of the following organizations is gratefully

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Substudy B2 : Library networking in Canada: the principal federal and provincial government agencies concerned

Flora Milne, Roddy Duchesne and Doreen Guenter were the authors of the report of this substudy; preliminary work on the substudy was done by Claire Frigon and Suzanne Richer. The assistance of the 6 federal agencies listed in section 4.2 and the 27 provincial agencies listed in Table 6 is acknowledged. In addition, the NLC Library Documentation Centre contributed; the assistance of Carolynn Robertson is particulary appreciated.

Substudy B3 : Library networking in Canada: principal relevant committees and associations

Mrs. Marianne Hurley was the principal investigator. The assistance of twenty committees and associations is acknowledged. There is not the space to list all of these here, but an entry for each appears in the substudy report. Roddy Duchesne, Doreen Guenter, and the staff of the NLC Library Documentation Centre also contributed to the substudy.

Substudy C1 : Externally submitted papers and views

The assistance of the organizations listed in the footnotes to section 5.2 is particularly appreciated. The footnotes employ acronyms to identify the organizations; Appendix C provides the proper names corresponding to each acronym. Brian Silcoff compiled the report of this substudy.

SUMMARY

The Canadian Computerized Bibliographic Centre Study was initiated in 1976 by the National Library of Canada in response to the recommendations of a national seminar. Its purpose was to review the present situation concerning computerized bibliographic centres in Canada and to report on the most effective means of promoting computerized library network development in the country.

The Study was conducted in the form of seven substudies each addressing a narrower and more specific aspect of the Study. The substudies were conducted by individuals; their findings and recommendations do not represent a National Library of Canada position. The CCBCS main report will present NLC approved proposals and recommendations for action in the area of library and information networks. It should also be noted that due to the difficulty of data collection, most of the information contained in the substudies covers 1976/77 only.

Section 1 of the present volume describes the origin and scope of the Study. Section 2 summarizes the salient features of the twenty Canadian and U.S. computerized bibliographic centres covered in the Study. The centres are shown to fall into three distinct types, namely, Information Retrieval Facilities (IRFs), Library Processing Facilities (LPFs) and Library Network User Groups (LNUGs). The characteristics of each of these types of centre are briefly described. In addition, the products and services currently offered, the scale of operation of each centre in terms of data bases, clientele and budgetary resources are also indicated.

Section 2 also records findings which sought to determine priorities for work on network standards. The principal findings in this area are that: NLC should concentrate its networking standards efforts on standards and protocols needed for computer-to-computer links; that present NLC involvement in bibliographic standards activities be continued; that consideration be given to the need for a user-oriented focal point which could represent user views and influence the vendors of on-line search services to standardize where feasible and practical; that NLC provide, as far as resources permit, a library automation consulting service to Canadian libraries and that NLC should use this service to help promote the use of appropriate standards.

Section 3 reviews major options relating to the development of a computerized national location service system. It is noted that there are many options between complete centralization and complete decentralization of such a system. Assessment of options is handicapped by a serious lack of statistics, particularly concerning interlibrary loan related data traffic in the country. Assessment of options is also handicapped by the severe limitations of modelling as a means of determining at any given point in time how much decentralization is feasible of data bases that typically support a range of library functions (e.g. cataloguing, interlending, acquisitions, information retrieval).

The models considered point towards the initial superiority of one (Model 1) in which a national centre maintains as comprehensive a national location data base as circumstances permit over another (Model 2) in which the national centre maintains a much more limited data base. In Model 2 the national centre is assumed to hold locations only for those libraries whose holdings data are not available through a multi-regional centre (e.g. UTLAS). When computer-to-computer communication is more widespread than it is today, the balance of advantages in favour of Model 1 will be less marked. At that time, the balance may swing in favour of Model 2, subject to a number of other factors. These factors include the need for publication of union catalogues and lists, and the extent to which individual libraries implement and maintain relatively independent individual automation arrangements.

Thus, a realistic approach is to continue to implement a relatively centralized computerized national location facility with as comprehensive a national location data base as circumstances permit, while taking opportunities to experiment with arrangements leading towards a more decentralized pattern. In this way, aspects of the system which it is desirable to decentralize can be decentralized in a series of practical steps each justified on its own merits and each tested experimentally in advance.

Section 3 also reviews technological and cost trends with an important bearing on library and information services networking in Canada. It is noted that computer memory devices and also computing power in the form of micro-processors, mini-computers, intelligent terminals, and other hardware, are becoming available at progressively lower costs; that data communication technology is steadily moving towards universal, intelligent, and shared data networks; that there is dramatic growth in the variety and number of accessible data bases and a dramatic fall in the costs of on-line searching; that in

combination these developments are expected to have profound impact on the future pattern of networking in all countries including Canada.

A review of the effect of technological, cost and administrative factors on the centralization/decentralization balance in network design confirms the conclusions drawn earlier on the basis of national location service modelling. The most practical approach to the problem of what function, resources and operations to decentralize is to proceed in a continuing series of practical steps, each justified on its merits and tested experimentally in advance. In this way functions, resources and operations which are best decentralized can be progressively decentralized; similarly, functions, resources and operations which are best centralized can be progressively centralized. Functions, resources and operations which, for the time being, appear to be administered on an adequately centralized/decentralized basis can be maintained on this basis. In a rapidly changing environment no balance of centralization/decentralization can be expected to remain optimum over long periods of time: this balance will require regular review on a continuing basis.

In the context of general NLC data base planning, a centralized and necessarily somewhat limited NLC bibliographic data base operated on a single installation may be considered as a feasible step towards a more decentralized and comprehensive Canadian national bibliographic data base. Experiments with other centres should be used to determine whether and what more decentralized arrangements are currently viable. These arrangements should then be implemented. Section 3 concludes with a library network scenario for the 1980's.

Section 4 summarizes the principal findings and conclusions of the three substudies dealing with more general aspects of network management and with the funding of network related R & D in Canada. The most important conclusions emerging from these substudies are that the National Library of Canada is the federal government agency with the broadest and most comprehensive mandate to initiate and support national and federal schemes for information and library network development in the country; that a precedent for a nationwide library and information network exists in the nationwide network of museums and exhibition centres which receives federal assistance and support under the National Museums Policy; that the existing mechanisms for funding network related R & D (through sponsorship by federal agencies and facilitated by bridge funds under the federal government's Unsolicited Proposals Funding scheme) must be considered adequate until proven otherwise by careful

monitoring over a period of time; that while a number of consultation arrangements exist within limited jurisdictions (i.e. single agency, single province), new arrangements will be required as broad-based federal and nationwide library and information network programs are developed; but that new consultation arrangements should be created only at the time of implementing the network programs that they are designed to support. The first priority is to agree on the networking programs to be mounted. Following this agreement, appropriate consultation arrangements should be implemented in conjunction with these programs.

Section 5 is a summary of the report compiled from externally submitted briefs concerning NLC's role. A summary is provided of the principal recommendations which both appear in the majority of briefs and relate to NLC's role with respect to computerized library network development in Canada. These recommendations are essentially that NLC: work towards the establishment of a nationwide bibliographic network consisting of a national computerized bibliographic centre and a number of regional or provincial bibliographic centres (supported by 8 submissions); provide leadership in planning and coordinating bibliographic services and resources in Canada (7 submissions); maintain and develop the Canadian national union catalogue on-line (6 submissions).

In addition, the last section also includes a selection of externally submitted comments and observations highlighting the problems and issues raised in the external briefs and submissions and identified in some of the substudies.

PREFACE

The Canadian Computerized Bibliographic Centre Study was undertaken by NLC in response to the recommendation of "An informal seminar on bibliographic centres in a Canadian library network" held at NLC on May 5 and 6, 1975 and attended by delegates from 19 organizations concerned with library and information network development in Canada. All regions of Canada were represented at the seminar. There were also representatives of most types of library, of the most concerned federal and provincial government agencies, and of the principal professional associations. Further details on the background to the CCBC Study and its terms of reference are provided in Appendix A to this volume.

The principal terms of reference of the CCBCS were:

> "to review the present situation concerning computerized bibliographic centres in Canada and to report ... on the most effective means of promoting desirable Canadian computerized library network development, including the development of a cooperative national union catalogue/ national bibliographic data base system ..."

In view of the scope of the study and the magnitude of the task involved, the study was conducted in the form of seven substudies over a period of about two and a half years from mid-1976 to early 1979. The seven substudies are:

A1: Computerized bibliographic centres (4 volumes, 289p.)

A2: National location service planning in an evolving Canadian computerized library network (131p.)

A3: Incompatibilities among on-line computerized bibliographic systems (3 volumes, 224p.)

B1: Funding for Canadian information and library network development (35p.)

B2: Library networking in Canada: The principal federal and provincial government agencies concerned (31p.)

B3: Library networking in Canada: Principal relevant committees and associations (62p.)

C1: Externally submitted papers and views (48p.)

The substudies were conducted by individuals; their findings and recommendations do not represent a National Library of Canada position. The CCBCS main report will present NLC approved proposals and recommendations for action based on a combination of:

a) A review of substudy recommendations as a composite whole in the light of current NLC forward plans.

b) Consideration of developments and factors not addressed, or only partially addressed, in the CCBCS substudies.

1. COMPUTERIZED BIBLIOGRAPHIC CENTRES

1.1 Introduction

This section summarizes the major findings of substudies A1 and A3 which deal respectively with the detailed description of the computerized bibliographic centres and the problems of compatibility amongst them. Substudy A1 describes and documents the following aspects of each centre: aims and objectives, management and membership, organization and finance, hardware and software used, automation applications, and finally, products and services offered.

Substudy A3 identifies problems of incompatibility amongst existing centres with particular reference to communications and terminals, character sets and codes, bibliographic languages, data base structures and indexing methods, and some specific operational features.

The factual data in substudies A1 and A3 arewhat could be obtained in mid to late 1977. While rapid developments in the field have outdated many of the individual figures presented, the overview presented is still essentially valid.

1.2 Types of computerized bibliographic centre

There are two broad categories of computerized bibliographic centres: those which provide computerized information retrieval services and those which provide computerized library processing services. The reason for dividing the centres into two major groups are two-fold. Firstly, the software and data base structures are radically different for the two groups, having been designed to achieve different objectives. Secondly, the problems of intersystems compatibility tend to be common within each group but quite different from one group to the other.

In this report as in the substudies, the following definitions are adopted for convenience:

> Information Retrieval Facility (IRF): A centre operating one or more computers to provide citation retrieval or information retrieval services from a number of data bases to more than one organization. Citation retrieval is typically the retrieval of references to journal articles, but abstracts associated with these references may also be retrieved. Information retrieval implies a greater scope of searching and retrieval including, for example, the searching and retrieval of full texts, and/or of numerical and representational data. QL Systems Limited is an example of an IRF.

Library Processing Facility (LPF): A centre that operates one or more computers to support one or more library technical processing operations for libraries of more than one institution. Library technical processing operations include cataloguing, circulation, interlibrary borrowing and lending, acquisition and serials control. The University of Toronto Library Automation System (UTLAS) is an example of a LPF. The nearest LC Network Development Office glossary equivalent term is "bibliographic utility".

Library Network User Group (LNUG): A formally constituted group of libraries using the services of one or more LPFs for one or more common purposes. The group is formed by a formal agreement amongst the members, normally including some form of contribution to the group's finances. Ontario Universities' Library Cooperative System (OULCS) is an example of a LNUG.

The name LNUG is used instead of Library Processing Facility User Group principally because most LNUGs engage in other cooperative activities besides making use of a common LPF. Examples of these activities are the building up and common use of shared data bases and files, and implementation of special interlibrary loan procedures and transit systems. The term LNUG reflects the more general scope of the activities of these groups; it also allows for the likely future pattern in which individual libraries, in a number of cases, belong to more than one LNUG while individual LNUGs use the services of more than one LPF.

These definitions are not mutually exclusive as there is some overlapping of functions performed, and of products and services offered, by some of the centres documented in the Substudy A1. The following table lists all the computerized bibliographic centres described in the substudy and the functional categories assigned to each centre. The centres described in the substudy include all Canadian IRFs, LPFs and LNUGs lying within the definitions given above in 1977. The major US LPFs and the largest US multi-subject IRFs are also included. US LNUGs are not covered. Persons wishing to obtain more information on the US LPF and LNUG scene may refer to Susan Martin's Library networks 1978-79[1] which covers three US LPFs, twenty-two US LNUGs and one Canadian LPF (UTLAS). The US IRF scene is generally surveyed in Roger Christian's The electronic library: bibliographic data bases 1978-79[2].

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1. Library networks 1978-79 by Susan K. Martin. White Plains, New York, Knowledge Industry Publications, 1978. LC 78-10666, 144p.

2. The electronic library: bibliographic data bases 1978-79, by Roger Christian. White Plains, New York, Knowledge Industry Publications, 1978. LC 78-18408, 105p.

TABLE 1 : TYPES OF BIBLIOGRAPHIC CENTRE

COMPUTERIZED BIBLIOGRAPHIC CENTRES, 1977			FUNCTIONAL CATEGORIES[1] IRF	LPF	LNUG
Canadian centres:					
AAU/BNA	-	Association of Atlantic Universities/Blackwell North America Project		S[2]	P
BCUC	-	British Columbia Union Catalogue Project			P
BNQ	-	Bibliothèque nationale du Québec		P	S[3]
CCBD	-	Centennial College Bibliocentre Division		S[4]	P
CISTI	-	Canada Institute for Scientific and Technical Information	P		
MTLB	-	Metropolitan Toronto Library Board			P
NLC	-	National Library of Canada	S[5]	P	
NRLS	-	Niagara Regional Library System			P
OULCS	-	Ontario Universities' Library Cooperative System			P
QL	-	QL Systems Limited	P		
TRC/NCRLS	-	Tri-Regional Catalogue/North Central Regional Library Systems			P
UTLAS		University of Toronto Library Automation Systems		P	
US centres covered by the CCBCS:					
BALLOTS/RLIN[6]	-	Stanford University Library System		P	
BNA		Blackwell North America, Inc.		P	
BRS	-	Bibliographic Retrieval Services, Inc.	P		
LC	-	Library of Congress	S[7]	P	
LIS	-	Lockheed Information Systems	P		
OCLC	-	OCLC, Inc.		P	
SDC	-	SDC Search Services	P		
WLN	-	Washington Library Network		P	

Notes:

1. P - Primary function
   S - Secondary function
2. Operating hardware, software, data base and production facilities on behalf of user group members.
3. As a member of OULCS.
4. Operating its own automated order and acquisition system.
5. IRF services provided in cooperation with CISTI.
6. BALLOTS was renamed Research Libraries Information Network (RLIN) in late 1978.
7. Exclusively for members of U.S. Congress and their research staff.

All the listed IRFs have their own proprietory retrieval software; however, the scope and sophistication of the search techniques of the software of the different centres varies. Similarly, LPFs mostly have their own custom written data base management and applications software.

Data bases maintained by computerized bibliographic centres are usually derived from multiple sources - local, national and international. All major Canadian LPFs make substantial use of data bases created outside the country; this is also true for one of the major Canadian IRFs (CISTI). The other major Canadian IRF, QL Systems Limited, operates largely with Canadian generated data bases.

Computerized bibliographic centres vary considerably in terms of their size and available resources, the nature of their clientele, and the geographic spread of their services. The following map gives some indication of the geographic distribution of the centres covered in the Substudy A1. It is to be noted that while all known Canadian centres meeting the definitions were included in the substudy, CCBCS resources permitted the coverage of only six US centres.

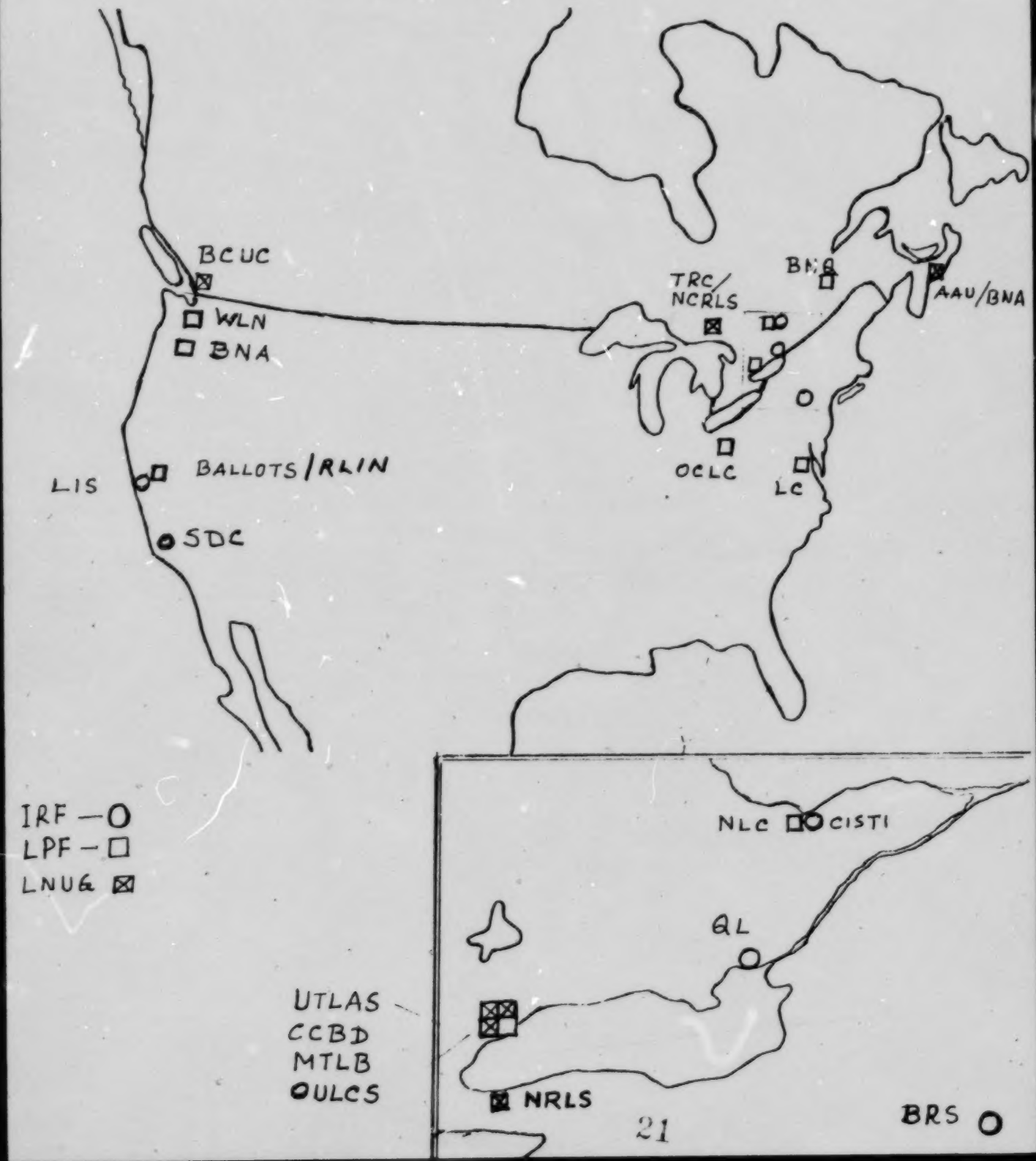
There is a general correlation between the functional category of a bibliographic centre and the geographical spread of its services. LNUGs provide only local or regional services while LPFs generally provide intra-national services, at least in their initial phase of development. IRFs, with a few exceptions, provide services across national boundaries right from their beginning.

1.3 Library Processing Facilities (LPFs)

Many types of organizations are engaged in the operation and marketing of library processing oriented services: purely commercial (BNA), national libraries (e.g. LC, NLC), academic libraries (University of Toronto, Stanford University), state libraries (WLN), and specially chartered organizations (OCLC Inc.). Some, like the last mentioned, are exclusively concerned with the operation and marketing of library processing services; others, like LC or NLC, produce and market such services only as part of a much wider mandate. Yet others, like the universities of Toronto and Stanford, have created special semi-autonomous bodies to deal exclusively with the development, operation and marketing of library automation services and products of their own respective organizations.

This situation has given rise to two somewhat parallel developments:

FIGURE 1 : MAP SHOWING COMPUTERIZED BIBLIOGRAPHIC CENTRES COVERED BY THE STUDY



a) Individual libraries and organizations can now buy computerized library processing services from one or more vendors or LPFs. There is no commitment to sharing of resources or to building common files with other users. This is the case for the majority of the organizations purchasing the services of BNA, for instance.

b) A number of individual libraries may also join formally defined user groups or LNUGs for the purpose of jointly buying library processing services from a vendor for one or more specific shared projects. Here the objectives are to build common files, share resources, and in general reduce costs of library processing for all members of the group.

There are, however, serious limitations to what an individual library or a LNUG can buy from the existing LPFs. There are not many LPFs to choose from and the range of products and services currently available is by no means comprehensive. This is particularly so in Canada where there are very few LPFs in the market. Thus, the libraries participating in the Association of Atlantic Universities/Blackwell North America Project (AAU/BNA) are presently limited to a batch processing system, since BNA software unlike that of UTLAS does not support on-line library processing services.

Furthermore, most LPFs tend to use specialized terminals so that it is in many cases impractical for a user with the terminal supported by one vendor to buy LPF service from another vendor.

The major LPF in Canada is UTLAS to which all but one LNUG are affiliated. By September 1978 it provided catalogue support service to over 65 institutions in Canada which in turn represented over 100 different library systems with over 500 individual libraries situated in five provinces from Quebec to British Columbia.[1]

NLC's major activity in the field of library processing services is the production and distribution of Canadian Machine Readable Cataloguing (CAN/MARC) records, and the conversion and distribution of national MARC records of the US, UK, France and Australia to Canadian users. NLC does not have an affiliated network but is expected, by 1980, to operate a shared library cataloguing system (DOBIS) for its own use and for those federal government libraries which may wish to use DOBIS facilities.

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1. "The UTLAS CIRC system" by Bonnie Campbell, in American Society for Information Sciences, Western Canada Chapter, tenth annual meeting, Winnipeg, September 27-29, 1978. Proceedings, p.27.

Available information on the financial and management aspects of the LPFs are neither uniform nor complete. Any attempt at comparing budgetary and user data, particularly between the dedicated and non-dedicated types of LPFs, gives rise to serious problems of data incompatibility.

Relationships between existing LPFs are generally characterized by competition rather than coordination and cooperation. The national library LPFs (e.g. LC, NLC) are exceptions within this competitive pattern, since they make serious efforts to coordinate their services.

So far competition between LPFs has tended to take place within national boundaries. However, there are indications that a North American LPF market will develop before long where major US and Canadian LPFs will compete for business across national boundaries, either directly or through brokers. The marketing of BALLOTS' (now RLIN) services in Mexico and the marketing of BNA services in Canada are the harbingers of such developments.

The current LPF market is dominated by publicly funded organizations operating large, costly[1] and highly centralized LPF systems mainly for publicly funded libraries and LNUGs. Technological developments will, however, change the future direction of developments in the field of computerized library processing services. Availability of minicomputers, intelligent terminals, other hardware, and software packages, at increasingly attractive prices and the high costs of operating and maintaining large centralized systems will encourage more and more libraries to automate their housekeeping functions

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1. Development costs of the Washington Library Network and University of Chicago software packages have been quoted as around $5 million each. In February 1979, Robin Braithwaite of UTLAS stated at a public meeting in the Atlantic Provinces that UTLAS employed some $6 million worth of computing hardware at that time. The computerized data files owned by UTLAS customer libraries and maintained on UTLAS facilities have been estimated to represent a capital investment of about $30-$40 million. This figure is taken from p.16 of Development of a Canadian national library network and national library network union catalogue de facto and de jure, by Paul E. Baldwin. (Paper given at "Evolution or Revolution: Colloquium on Library Catalogues", February 8-9, 1979, Saskatoon Public Library, Saskatoon, Saskatchewan).

functions individually or jointly with other libraries in their locality.[1] Large LPFs will increasingly be used only for library processing activities requiring a more powerful processor than can be provided within individual libraries.

1.4 Library Network User Groups (LNUGs)

The development of library network user groups has been made possible by the readiness of major LPFs to market their products and services in order to spread the costs of maintaining their systems.

Similar or similarly oriented libraries have in general tended to form a LNUG for purchasing library processing services from a given LPF. The potential benefits can be considerable in such an arrangement. Without deploying substantial resources of their own, individual libraries can automate important housekeeping functions, can build up union files of cataloguing and holdings data, avoid or reduce duplication of cataloguing efforts, rationalize collection building and utilization and in general reduce the costs of technical processing. The net result to the user can be greatly improved services without a proportionate increase in the cost of library operations.

There are now seven LNUGs in Canada: all of them except for AAU/BNA are affiliated with UTLAS. Table 2 below indicates the size and financial resources of Canadian LNUGs as of late 1977. None of the LNUGs either own or rent a computer. Instead, each purchases machine time from the computer centre of the LPF with which it is affiliated. One LNUG (OULCS) purchases machine time from the computer centres of several member universities for specific projects. The AAU/BNA group operates leased BNA software on the central computing facility of the University of New Brunswick which is a member of the group.

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1. "The emphasis on local autonomy and the availability of technology (like mini-computers) for local processing are bringing about a return to the 1960s approach to library automation. Libraries will obtain in-house systems or contract out on an individual basis for service. At the same time they will continue to use existing network resources for bibliographic access and for information about holdings of other libraries. The network revolution will slow to an evolution" - Martin, op. cit., p.107.

TABLE 2: CANADIAN LIBRARY NETWORK USER GROUPS: AVAILABLE MEMBERSHIP, TERMINAL AND BUDGET DATA, LATE 1977

LNUG	Predominant type of library	Total member-ship[1]	Number of terminals used	Staff person-years	Budget ($1000)
AAU/BNA	Academic	17	None[3]	7	93
BCUC[4]	Academic	7	4	3	306
CCBD	Academic	21 (105)	10	74[5]	1200
MTLB	Public	11 (252)[6]	5	8	176
NRLS	Public	4 (45)	2	41[5]	625
OULCS	Academic	32	43	11	1500
TRC/NCRLS	Public	11 (140)	2	8	83
Totals		103 (598)	66	152	3983

Notes:

1. Where LNUGs include multi-library organizations as members, the numbers within brackets indicate the total number of individual libraries. Numbers were supplied by the LNUGs and may not be based on a uniform method of counting.

2. These statistics were provided by the LNUGs, and are not comparable. They generally include staff in individual libraries working on LNUG work as well as central LNUG full-time staff.

3. Batch system.

4. As of March 1979, BCUC had 24 member libraries, the majority of which are public libraries.

5. These two LNUGs also provide central acquisition and book processing services to their members; hence the comparatively large number of person-years.

6. MTLB operated two different projects with different memberships; the largest project included a total of 252 individual libraries. OULCS operated a total of 7 different projects with membership varying from project to project. One of the largest and most important of these projects is the UNICAT/TELECAT shared cataloguing project which is administered in cooperation with the Conference of Rectors and Principals of Quebec Universities.

Well established LNUGs have central agencies with full time staff. There is normally a formal contract between the LNUG and its host LPF. The staff sizes of these LNUGs are fairly small, ranging from 3 to 11 man-years, with two exceptions. The exceptions are those which provide central acquisitions and book processing services as well. Normally, the groups are provided, on a contractual basis, with additional systems and programming staff time and expertise by the LPF with which they are affiliated. Data bases created for the LNUGs are maintained at the computer centre of their LPF. In addition, all groups draw heavily on the comprehensive source files maintained by their respective LPFs.

At present Canadian LNUGs are essentially buying one or more products and services marketed by the LPFs. The necessary software is designed, operated and owned by the vendors. This situation may change in future when LNUGs may prefer to design their own applications software, have it custom made or just choose an existing package and then run it on the computer installation of a vendor or of a member organization.

One Canadian LNUG (CCBD) has already taken a step in that direction. CCBD has obtained DOBIS software from NLC and is operating the system in-house to search the CCBD data base and to produce COM output of holdings of its member libraries. Another LNUG (AAU/BNA) leases a software package from a vendor (BNA) and runs it on the computer installation of one of its members.

The options for individual libraries as well as for LNUGs will greatly increase as more vendors appear in the market with increasingly standardized and wider ranges of services. The availability of fairly readily replicable LPF software is likely to have a major impact on the LPF market in Canada within the next few years. Examples of replicable LPF software include DOBIS and WLN software.

1.5 Information Retrieval Facilities (IRF)

The pattern of development in the field of information retrieval services has followed a parallel but different path from that of library processing services. Here, with some notable exceptions, the vendor of information retrieval services procures the data bases from a variety of producers in widely different fields of activities; by contrast LPF data bases are normally built at the LPFs using a mixture of original and derived records. What the vendor of information retrieval services does provide are the necessary hardware, software and expertise that enable individual users to search, for a fee, any of the data bases for bibliographic or other types of information.

The growth of IRF services has been very impressive in recent years, as indicated in the following quotation:

> "It is undeniable that on-line searching has entered a growth phase, and that there is a very definite market for on-line service. For example, Wanger (1976) estimates that in 1975 there were about 1,000 user organizations world-wide. There has, of course, been very considerable growth since then - in 1977 Lockheed Information Services (sic) reported that DIALOG alone was used by upwards of 3,000 users.
>
> In terms of the number of individual on-line users and on-line searches carried out, growth has been equally impressive. While it is difficult to obtain accurate statistics the figures reported by many writers, e.g. Barlow (1976), Tomberg (in, Cranfield, 1977) and Williams, M.E. (1977) can be taken as broadly correct. On-line searching in the U.S.A. is estimated to have increased from 280,000 searches in 1972, to about 1,200,000 searches in 1976 with a 1976-77 growth rate of about 20% p.a. Growth is also now being observed in European use of on-line search systems. Several studies (PA International, 1975; Pandata, 1975) are available predicting considerable future European growth; while further growth can confidently be expected, Tomberg (in, Cranfield, 1977) correctly points out the hazards of statistical forecasting in this area. It does seem reasonable, however, to expect on-line use in Europe to grow to well over 1,000,000 searches p.a. within the decade 1980-1990."[1]

This growth of IRF services has been aided by a combination of favourable conditions:

- Universality of demand for scientific and technical information including social sciences and business information, and a large measure of uniformity in user requirements.
- Development of telecommunication networks capable of speedy and economic transmission of digital data over long distances.
- Non-specialized nature of terminals required for access to the IRF services.

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1. On-line retrieval sourcebook by J.L. Hall. London, England, Aslib, 1977, p.35.

- Dramatic growth in the number and variety of accessible data bases containing information of interest to a widening spectrum of users. According to R. Christian, the number of available machine readable bibliographic data bases grew from slightly more than 100 in 1975 to more than 360 in early 1978.[1]

- Dramatic fall in the costs of on-line searching. Again, according to R. Christian, the "direct costs per online search have dropped in the past three years from an average of about $50 to more like $25 now (early 1978) - and one vendor's ads even claim that we are now in 'the era of the $5 search'. While these figures and their underlying assumptions are not directly comparable, it is nevertheless clear that typical, direct online search costs have fallen dramatically during this period."[2]

- Appearance of information brokers or subsidiaries of major IRFs in different regions of the continent.

- Cost of services being based strictly on the amount of service received and the user having no financial responsibility towards the maintenance of the IRF.

Both public and private organizations are involved in the operation and marketing of IR services, public organizations playing a relatively larger and more important role in Canada. In North America as a whole, the field, however, is dominated by private sector IRFs. This is hardly surprising in view of the large and potentially very lucrative market involved. In terms of the scale of their operations, the number and variety of data bases at their command, and the scope and sophistication of their services, the large privately operated IRFs stand apart from the non-profit IRFs operated by public organizations.

Charges for IRF services vary from vendor to vendor and vary within the charging scheme of a given IRF from data base to data base depending on data base royalty schedules. The variety of charging methods employed by different vendors makes it rather difficult to compare the costs of services from vendor to vendor. This is further complicated by the fact that most IRFs hold several exclusive data bases not marketed by other vendors. However, with the increasing

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1. Christian, op. cit., p.1.

2. Ibid.

competitiveness[1] of the IRF market there appears to be a trend towards actual reduction or at least stabilization of charges for IRF services.

Unlike LPFs and their affiliated groups of users (LNUGs), users of IRF services have not formed cooperatives or user groups to operate IRFs or to buy services jointly from vendors. The major IRFs tend to be international in scope and operations. Thus, LIS, SDC, BRS are all major US-based IRFs but all have a great many customers all over continental North America and a growing number in Western Europe. Thousands of users both in the public and the private sectors in many countries, including a growing number in Canada, are making use of these services. This trend is likely to grow in strength as access to an ever increasing number and variety of data bases and data banks is offered by more and more vendors and brokers in the market and as digital data communication networks like Telenet, Tymnet, etc., expand to more and more cities and population centres.

Four of the IRFs (BRS; LIS; QL; SDC) described in the substudy are strictly commercial operations; details concerning the number of users, number of terminals, etc. were unobtainable - such information being regarded as proprietory and confidential.

In 1977, there were two major IRFs in Canada, i.e. CISTI and QL Systems Limited; they are described below. Because the time required to conduct a comprehensive survey of all Canadian IRFs was not available, IRFs such as Informatech France - Québec were not documented. BADADUQ was not included as an IRF because it served the libraries of only one institution (Université du Québec).

In Canada, the federal government involvement in the IRF services is quite substantial as two of its agencies (NLC, NRC) have mandates for providing nationwide services. The Canadian IRF, CISTI, serves as a focal point for several IRF operations. By July 1977, its CAN/SDI service had a total of over 1,400 individual and group subscribers serving nearly 4,300 users in various fields of science, engineering and medicine. Its on-line IRF service, CAN/OLE, had at that time 271 remote access terminals in 111 regional centres across

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1. "Chaotic competition" according to Christian, op. cit, p.58.

the country. NRC's Technical Information Service (TIS) provides a variety of information services to aid small and medium sized manufacturers including a current awareness service (CAN/SRP) which regularly provides to over 4,600 (July 1977) small Canadian industries individualized lists of documents which can be requested from CISTI.

NLC provides a current awareness service in the social sciences to 257 subscribers against 8 data bases serving nearly 1,200 users in various parts of the country. (July 1977 statistics).In addition, as a service to external customers, NLC makes use of seven on-line information retrieval services and thus has access to a large number of on-line data bases.

QL has over 200 users, approximately half of them are libraries. It offers access to a total of 34 data bases of which 29 are Canadian. Sixteen of these are full text data bases and 6 are French language equivalents of English language data bases (August 1977 statistics).

1.6 Data bases and computerized services

Data bases are central to the operation of computerized bibliographic centres and are produced in a wide variety of ways. Those used by LPFs are generated in the process of supporting library processing functions such as cataloguing, circulation control, serial control, acquisition control, union catalogue operation, etc. They basically consist of catalogue records and may also include additional information relating to other library operations such as ordering, receiving, circulation, and accounting.

IRFs, on the other hand, use data bases produced by many more types of organizations in addition to libraries. Often these data bases are the by-products of activities in computerized printing of indexes and abstracts and sometimes full texts of certain types of documents. Increasingly, organizations in both public and private sectors are producing machine-readable files of numerical, representational and statistical data. Thus, in terms of data content the data bases used by IRFs cover a wide range from purely bibliographic to representational (e.g. graphical, chemical structures) data.

In terms of data content and record communications format, data bases display a wide range of variations. Library processing oriented data bases generally have a different content and use a different communications format from data bases oriented towards information retrieval and the production of printed or microform abstracts and indexes. Some of

the important national bibliographic data bases generated in a library processing environment are distributed in national standard formats. This is rarely the case with data bases generated in other types of activities. In general, the IRFs have to contend with a bewildering variety of data base formats and content standards. Moreover, many of these were never designed to be used in an on-line environment.

Not all library processing oriented centres at present maintain their data bases on-line, although the trend is definitely towards on-line interactive systems. BNA employs a batch processing system while both UTLAS and LC keep on-line the indexes to all records in all their data bases, but keep only a proportion of the records on-line.

On the other hand, the major IRFs keep all their data bases and records on-line. There are many ways in which data bases are searched by different computerized centres. The simpler search techniques with a few search keys are usually employed by LPFs. More sophisticated and versatile search techniques using thesauri, keywords and their logical combinations are used by most IRFs.

The following two tables summarize the number and the size of data bases and the library processing oriented products and services offered by the computerized bibliographic centres described in substudy A1. It will be seen that the data bases vary greatly in size as well as in the extent to which they are maintained on-line. Also, although it is not indicated in any of the tables, the size of the clientele and the scale of operations vary equally from centre to centre. Furthermore, the growth rates are in general quite uneven, the newer centres tending to grow at a faster rate than the older and larger ones.

None of the LPFs at present offer a full range of library processing services. The most common services offered are catalogue and union catalogue support. However, almost all the LPFs plan to implement further computerized applications.

All IRFs offer on-line computer searching of data bases held by them. Most also offer off-line printing of on-line search output. One centre (LIS) has recently added a new feature to its services, namely, on-line training and practice in computerized literature search. Another centre (QL) provides on-line text editing services, computer conferencing, and computer programme editing. With the exception of one, (i.e. QL) all IRFs either have, or plan to have, SDI services.

In general, IRF software is available either on lease or outright purchase, but is not actively marketed by the IRFs.

TABLE 3: COMPUTERIZED BIBLIOGRAPHIC CENTRE

DATA BASE SIZES, 1977

	COMPUTERIZED BIBLIOGRAPHIC CENTRES	INFORMATION RETRIEVAL				LIBRARY PROCESSING		
		DATA BASES		RECORDS ($\times 10^6$)[2]		DATA BASES[1]	RECORDS ($\times 10^6$)[2]	
		ON-LINE[1]	TOTAL[1](*)	ON-LINE	TOTAL		ON-LINE	TOTAL
CANADIAN CENTRES	IRF:							
	CISTI	8	17(6)	4.80	11.90			
	QL	33	33(28)	0.70	0.70			
	LPF:							
	BNQ					3	0.02	0.05
	NLC	0	5(1)		0.56	4	-	1.00
	UTLAS					28	0.45	3.34
	LNUG:							
	AAU/BNA					1	-	0.06
	BCUC					1	0.01	0.01
	CCBD					1	0.01	0.34
	MTLB					2	0.02	0.02
	NRLS					1	0.01	0.03
	OULCS					3	0.05	1.03
	TRC/NCRLS					1	0.01	0.09
U.S. CENTRES	IRF:							
	BRS	11	11(1)	3.50	10.00			
	LIS	51	51(34)	19.00	19.00			
	SDC	33	33(19)	12.20	12.20	1	0.80	0.80
	LPF:							
	BALLOTS					1	1.07	1.07
	BNA					5	0	2.45
	LC	3[3]	3[3]	0.25[3]	0.25[3]	5	0.80	1.20
	OCLC					1	3.08	3.08
	WLN					1	0.92	0.92

Notes

* Number of exclusive data bases
1. There is duplication of data bases between centres
2. There is considerable duplication of records between the data bases of the different centres
3. Exclusively for members of U.S. Congress and their research staff

TABLE 4: PRODUCTS AND SERVICES OFFERED BY LPFs AND USED BY LNUGs, 1977

CENTRES / PRODUCTS AND SERVICES		CANADIAN CENTRES										U.S. CENTRES				
		LPFs			LNUGs							LPFs				
		BNQ	NLC	UTLAS	AAU/BNA	BCUC	CCBD	MTLB	NRLS	OULCS	TRC/NCRLS	BALLOTS	BNA	LC	OCLC	WLN
Producer of source cataloguing data		X	X										X	X		
On-line shared cataloguing facility*				X		X	X	X	X	X	X	X			X	X
Catalogue cards/ processing kits				X	X	X	X		X	X	X	X	X	X	X	X
Catalogue of bibliographic records	Hard Copy	X	X	X	X		X	X	X	X	X		X	X	X	X
	Microform	X	X	X	X	X	X			X	X		X	X	X	X
Union list/ catalogue					X			X	X	X	X					
Access to records of other members of LNUG						X	X	X	X	X	X					
Record conversion to MARC			X	X										X		
MARC tapes of data bases of	National/ network	X	X									X	X	X	X	
	Participant libraries			X								X				
System software			X	X								X	X			X
SDI Search Service			X									X	X	X		
On-line record search				X								X			X	X

* This includes original and derived cataloguing

1.7 Aspects of intersystems compatibility

Substudy A3 examines the technical and operational details of each of the following computerized bibliographic centres.

Library Processing Facilities (LPFs)	Information Retrieval Facilities (IRFs)
BALLOTS	BRS
LC	CISTI
OCLC	LIS
UTLAS	QL
WLN	SDC

The primary objective of this substudy was to identify major incompatibilities that might stand in the way of future interconnection amongst these systems and to recommend any immediate action that might be called for at the national level.

The substudy finds that although there are many incompatibilities of a technical nature amongst these systems and the data bases used by them, none of these incompatibilities, with the possible exception of one (i.e. incompatible character sets), are likely to prove serious obstacles to future networking efforts. Nonetheless, these incompatibilities can be a problem for any user wishing to have access to more than one system through a single terminal. Incompatible character sets exist where one system or data base employs characters (especially non-standard characters) not used by another system or data base. Mostly the systems and services employ very similar character sets: there is a very small number of troublesome characters. These characters cause the greatest problems where they appear in search terms.

The IRFs appear to be the least problematic for access through a single terminal. With a simple off-the-shelf unintelligent terminal the user can access all major on-line search systems by leased line, direct dial, through dial-up to a Tymnet or Telenet node or through local dial-up to a Dataroute termination point (for QL and CAN/OLE). This almost universal accessibility has been greatly facilitated by the combination of two highly favourable factors, namely, the existence of a strong commercial motivation amongst the IRFs and the development of intelligent shared data networks

like Telenet, Tymnet, etc. The designers of IRFs had every incentive to make their services accessible to the greatest number of customers through simple teletype compatible terminals. Also, the intelligent data networks themselves can and do automatically perform many necessary conversions relating to speed, mode, code, etc., and thus enable otherwise incompatible devices to communicate with one another.

A user with a standard unintelligent terminal such as a VuCom-1 could theoretically access major LPFs like BALLOTS, OCLC, UTLAS, WLN, etc., with appropriate long distance charges wherever applicable. On the other hand, a user with any one of the specialized terminals supported by a given LPF (e.g. IV-Phase, OCLC/100, Zentec 9003, Hazeltine, etc.) may not access any of the other LPF services without further modification of the terminal. In general, multi-system LPF access using a single terminal is not at present very practicable.

The most problematic is the access to both IRFs and LPFs, through a single terminal. In addition to terminal and communications related incompatibilities, the user is faced with other incompatibilities related to very different operational features, command languages, record access methods, data base structures, indexing methods, system performance priorities, and so on. Only with widespread standardization can multi-system access via a single terminal be made feasible for individual users.

However, it might be quite unrealistic to attempt a high level of standardization in a field that includes a growing number of private sector organizations and has generally favoured a laissez-faire approach. Also, a number of incompatibilities (e.g. indexing methods, search procedures) cannot easily be standardized. Substudy A3 suggests:

a) That NLC concentrate its efforts on the development of computer-to-computer links between shared-cataloguing systems rather than attempting to "standardize" systems so that one user can access multiple systems directly. NLC's DOBIS* system should be implemented with this in mind, and NLC should promote the development of protocols for such highspeed links. Also, the effects of packet-switching techniques and protocols upon the operation of DOBIS should be studied.

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* DOrtmunder BIbliotheksSystem

b) That present NLC involvement in bibliographic standards activities be continued.

c) In the area of search systems, that NLC form a user-oriented Canadian "focal point", possibly in the form of a user group, and that this focal point use its power to influence the vendors of on-line search services to standardize where feasible and practical, recognizing that past efforts in this area have met with only limited success.

d) Finally, the setting up by NLC of a library automation "consulting" organization to provide expertise to Canadian libraries wishing to automate and to permit NLC to influence automation activities and thus to nip in the bud many incompatibilities before they have a chance to develop. This could parallel similar services already provided by NLC's Computer Based Reference Service to potential users of on-line search systems.

2. COMPUTERIZED NATIONAL LOCATION SERVICE PLANNING IN CANADA: TECHNICAL AND ECONOMIC ASPECTS

2.1 Introduction

Substudy A2 examines technical and economic factors with particular reference to the planning and development of a computerized national location service system in an evolving Canadian computerized library network. There were several reasons for choosing this as the focus of the substudy, rather than library technical processing or information retrieval, or the totality of computerized bibliographic network planning. The totality of computerized bibliographic networking was too large a subject to address within the resources available.

Computerized national location service planning was selected as a focus for two main reasons. Firstly, the Canadian Union Catalogues and their associated operations and services dwarf, in terms of volumes of bibliographic records and requests handled, all other NLC programs. This fact was clearly documented in the report of the Canadian National Bibliographic Data Base Study.[1] The latter report showed shot this area forms, in volume and service terms, the centre-piece for NLC bibliographic systems and data base planning. Secondly, there is a wider and stronger national consensus in favour of direct NLC involvement in national location service network planning and development than in favour of its direct involvement in other aspects of computerized library network planning and development. This consensus shows itself in a number of ways, for instance, emphases which are implicit in the National Library Act 1969[2] and in the Final report of the Canadian Union Catalogue Task Group.[3]

Since computer and communications technologies are playing increasingly crucial roles in the design and operation of library and information services, certain aspects of these technologies are examined in the substudy. Technological developments are seen to be opening up new options not only in the design of individual library systems but also in the area of networking as a whole. Some of these options are examined and certain conclusions are drawn.

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1. Canadian national bibliographic data base study: the report, by Roderick M. Duchesne. Ottawa, National Library of Canada, 1974, 60p. + 10p. Appendices.

2. National Library Act, 1969. Revised Statutes of Canada, C.N-11.

3. Canadian Union Catalogue Task Group final report. Ottawa, National Library of Canada, 1976, 86p.

2.2 Computerized national location service planning

The future library and information network in Canada will include a national location service data base as a major component. The base will likely serve other functions as well as a national location service function, but will serve at least the latter function. An example of an additional function is the supply of machine readable bibliographic data to libraries for use in their computer system, e.g. for technical processing. The substudy makes an estimate of the size of such a data base on the basis of the current size of the Canadian Union Catalogues of Books and Serials (estimated 4.6 million titles in 1975) and the anticipated rate of growth during the next few years. By 1982, this composite file (of mostly manual and some machine readable records) is expected to include records for some 6 million titles. Whether a central automated national location service data base will actually reach this size by 1982 is difficult to forecast at this stage. Much will depend on whether the data base emerges as a centralized or a distributed one.

There are many options between a completely centralized and a completely decentralized system and the balance between centralization and decentralization at any given point in time will be determined by a complex of factors - economic, technical, organizational, political, user needs and preferences, and so on. Organizational funding and political factors will predominate over technical and economic factors where various options are technically and economically feasible.

A possible option is a centralized union catalogue/national location service data base operated by NLC and CISTI. The substudy estimates that by 1980/81 the combined NLC/CISTI union catalogue data bases will have about 2.2 million records of which 0.67 million will have some holdings information. Such a combined data base will require some 1,500 megabytes of on-line storage capacity equivalent to 8 IBM-3330-11 disk drives. (Compare: UTLAS used 15 disk drives of 200 megabytes each for its CATSS services in 1977).

Operation of such a union catalogue system will require an estimated 10 terminals to handle all accession reports, and another 10 terminals to handle requests against the data base. Assuming location requests to remain relatively stable at about 650 per day, it is further estimated that 50% will be answered by computer, 30% manually, and 20% not at all. For details of how these figures were arrived at, the reader is referred to chapters 10-12 of the substudy report.

However, there are other options likely to be rendered increasingly feasible by technological developments. Assessment of these options is greatly handicapped by a serious lack of statistics, particularly concerning interlibrary loan related message traffic in Canada. In Substudy A2 order of magnitude calculations are made starting with the data from a limited survey conducted by Basil Stuart-Stubbs and his team in 1974. On the basis of a variety of more or less plausible assumptions, it is estimated that by 1982 approximately 5.5 million interlibrary loan related messages will travel through the nationwide bibliographic network in one year. On the further assumption that most data transmissions will take place via packet-switching networks in 1982, the above estimate of message traffic corresponds to 4.5 million data packets per year. The actual pattern of this data traffic and its costs will depend to a large extent on the structure and organization of the network - whether the data traffic moves in a centralized or distributed type of network or one with a mixed type of structure. While options were severely limited in the past this is no longer the case.

Unfortunately, the lack of sufficient and sufficiently reliable statistics is only the first layer of the problem of theoretical analysis of options. Beyond the problem or lack of statitics there are severe limitations to the modelling approach as a means of determining how much decentralization is feasible. There are myriad options at any given point in time and it is only feasible to model a handful of options out of many million. Worse, the optimum is shifting relatively rapidly through time so that the best option for today is not likely to be the best option in, say, three years time; the best option in three years time will, in turn, be sub-optimum in, say, five years time. Worse again, one is really dealing with multi-application data bases supporting a range of library processes (e.g. cataloguing, interlending, acquisitions, information retrieval), and this compounds the problems already mentioned unless modelling is restricted to one application - in which case model results have limited value and there is a high probability of sub-optimization.

While there are severe limitations to the modelling approach, models considered in Substudy A2 point decisively towards the initial superiority of a model (Model 1) in which the National Location Facility maintains as comprehensive a National Location Index as circumstances permit, over a model (Model 2) in which the National Location Facility maintains only a Multi-Regional Location Index including locations for libraries whose data is not held by a Multi-Regional Location Facility. The choice between the models is

less clear cut in the medium to longer term. The balance of advantages in favour of Model 1 will be less marked following the advent of widespread computer-to-computer communication between the National Location Facility, Multi-Regional Location Facilities, Regional Location Facilities, and local libraries. Depending upon factors such as the need to publish national union catalogues and lists, the balance of advantages may tilt in favour of Model 2 at that time. However, the balance of advantages may subsequently tilt back again (or, if it stayed in favour of Model 1, tilt more strongly) in favour of Model 1 when (as is likely) many libraries implement and maintain relatively independent individual automation arrangements. Libraries in the latter situation may not record their location data in Regional Location Indexes or Multi-Regional Location Indexes.

A realistic approach is to continue to implement a relatively centralized computerized National Location Facility with as comprehensive a National Location Index as circumstances permit, while taking opportunities that present themselves to experiment with arrangements leading in the direction of a more decentralized pattern. Arrangements which pilot projects show to be feasible and cost effective can be implemented. In this way aspects of the system which it is desirable to decentralize can be decentralized in a series of practical steps each justified on its own merits and tested on a pilot basis.

This evolutionary approach is needed not only to bypass modelling difficulties but also to cope with organizational (e.g. contractual) arrangements and to avoid de-stabilizing interlibrary loan patterns in an unpredictable and counter-productive manner. There is a danger that sudden changes in location service arrangements may work to raise excessively the interlibrary loan demands on given libraries, resulting in their raising interlibrary loan charges and/or adopting other load shedding arrangements, with a possible ripple effect through the system.

While the maintstream of NLC location service development should follow the pragmatic course outlined above, a number of more detailed findings and conclusions are that:

(i) NLC should coordinate its location service planning as closely as possible with CISTI planning of related services, and should consult closely with LC.

(ii) NLC should contribute towards at least the federal (extra-provincial and extra-regional) aspects of regional bibliographic centre planning, for example, Saskatchewan Provincial Union Catalogue and Nova Scotia Provincial Union Catalogue planning.

(iii) NLC should promote the development of computer/communication protocols suitable for intercommunication between Canadian computerized bibliographic centres.

(iv) Planning exercises or studies need to be mounted to bring together missing traffic statistics; to produce a more fully worked out NLC data base strategy; to determine if and how Canadian Union Catalogue data should be published; to elaborate the role of the NLC/CISTI DOBIS system and data base in the Canadian bibliographic network.

The remainder of section 3 provides background to the conclusions outlined above.

2.3 Aspects of computer technology

The most significant development in computer technology is the increasing availability of cheap computing power in the form of micro-processors, mini-computers, and peripheral devices with built-in intelligence. There is a strong trend towards the commercial production of hardware components with enhanced capabilities at progressively lower costs. These developments are bound to influence the entire design philosophy of future computerized systems.

As the technology of disk storage devices moves towards ever increasing capacity combined with decreasing cost per unit, large on-line bibliographic systems will become increasingly viable and cost effective. Advances in the technology of magnetic bubble and charge coupled memory devices will also begin to influence the design of on-line systems by 1980, since this technology offers order-of-magnitude improvement in speed of access and storage costs.

Another important component whose capabilities are being greatly enhanced by the current advances in technology is the terminal. Within the next few years, the most basic terminal can be expected to be programmable to some extent. This means that such a terminal will be able to offer data entry and text editing facilities, and in addition have several thousand bytes of memory to buffer records before and after transmission.

2.4 Aspects of communication technology

The progress now being made in many countries, including Canada, towards universal, shared, and intelligent data communications networks may prove to be the single most

important development for the future of library and information systems networking in Canada. Such telecommunication networks are built around mini-computer based switching nodes which are connected by high speed digital transmission facilities. The mini-computers can be programmed to undertake a variety of applications-independent communications-related functions which today take up costly main-frame or front-end capacity.

The intelligence in the network allows sophisticated and highly effective control and diagnostic mechanisms to be built into the network, thereby making it practicable for many users with different devices and applications to interconnect. A central network control centre that constantly monitors the performance of the network is an integral part of such a network. In addition, critical elements in the network can be provided with back-up facilities ready to take over in the event of breakdown or deterioration of service. All these highly desirable features can be designed into a shared network but would be prohibitively costly to include in a private or dedicated network.

Of the many technologies employed in data transmission, it is the technology of packet-switching which promises to deliver the greatest benefits of a universal, shared, and intelligent network. Most of the intelligent data networks now being built in other countries are also of the packet-switching type. By using common packet and other communication standards, it is possible for many types of computers and terminals built by many manufacturers to communicate with one another. Such a standard now exists in the international standard protocol X.25 as ratified by the International Telegraph and Telephone Consultative Committee (CCITT). Its implementation by manufacturers and communication carriers is, however, not universal.

At the time substudy A2 was conducted, both TransCanada Telephone System and CN/CP were in the process of implementing packet-switching networks called, respectively, Datapac and Infoswitch. Datapac was already in limited use and it appears almost certain that the use of packet-switching networks in Canada will greatly increase in the near future.

Because the communication system and the user communicate in the form of data packets, it becomes possible, for the first time, to create a charging system that is based primarily on the amount of information sent and is thus largely independent of distance or connection time or band width leased. This is of particular importance to many small users dispersed over a wide geographical area as in Canada.

2.5 Cost aspects

Technological developments seem to be pointing not only towards improved and more flexible system design but also towards a more cost effective system implementation and operation. Substudy A2 examines certain major cost factors relating to hardware, data communications, software and personnel. A detailed examination of current trends leads to the following projections made in terms of 1977 Canadian dollars[1]

Within the next few years, today's basic dumb display terminal costing upwards of $1,000 (1977) will be rendered obsolete in favour of a fairly intelligent unit at about half the price. Modified terminals presently used in shared cataloguing systems such as OCLC, BALLOTS, WLN, etc. will cost between $1,300 and $1,700.

The current cost per byte of incremental main memory in medium and large computers is around 12 cents and will drop at a rate of about 33% per year for the foreseeable future.

Communications costs will be reduced with the advent of packet-switching. Average per kilopac network usage costs in a bibliographic system environment are computed in Substudy A2; other cost factors such as the cost of network connection, etc., are also determined. Based on 1977 figures, the substudy estimates that communications costs will decrease in a step function manner equivalent to a steady decrease of 19% per annum between 1977 and 1985.

Salary and overhead costs of analysts, programmers, and operators will rise at a rate of approximately 1% per year in the foreseeable future. The total system costs are currently split about 80/20 between software/hardware. With the right design philosophy it will be possible to reduce software costs. At the same time hardware costs are falling at a much faster rate. Cost projections are summarized graphically in the following figure (Fig. 2).

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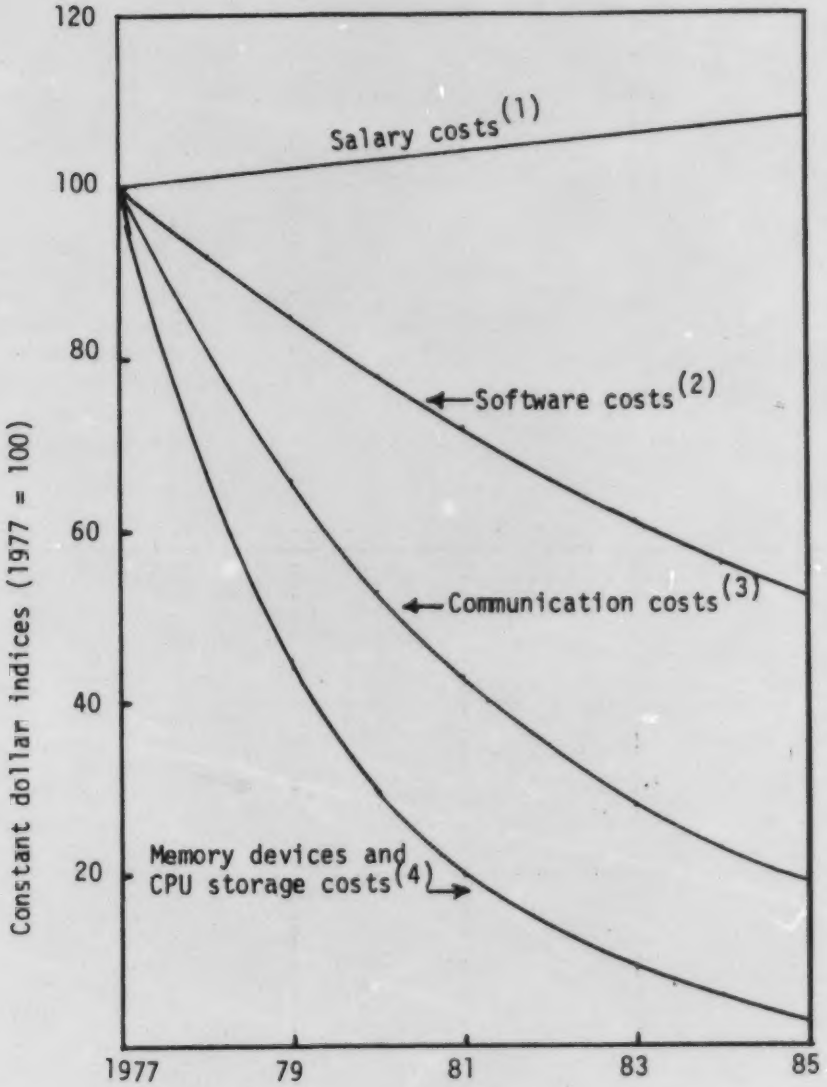
1. The figures in section 3.5 are Substudy A2 figures recalculated to 1977 Canadian dollars using an 8% annual inflation rate during the projected period, and a 1% annual growth rate in real gross salaries of computer programmers and analysts. The last figure is not derived from the Substudy A2 figure of 6% but calculated on the basis of recently published data for the growth of salaries of programmers/analysts in the US and on the assumption that US and Canadian cost trends will be closely parallel in the intermediate and longer term.

FIGURE 2: PROJECTIONS FOR HARDWARE, SOFTWARE, COMMUNICATIONS AND PERSONNEL COSTS, 1977-1985



1. Cost per year per person (analysts, programmers and operators)
2. Cost per executable machine instruction
3. Cost per character transmitted
4. Cost per byte stored

2.6 The centralization/decentralization balance

General benefits of all these technological developments and favourable cost trends are not difficult to foresee. For example, it will become increasingly more cost effective to design systems with a high level of hardware redundancy and a greater specialization of functions between processors. This will have the effect of greatly enhancing the overall reliability of future systems. Not only can hardware redundancy be used to reduce hardware down-time but specialization of functions between processors can reduce the need for highly complex software. Less complex software is generally easier to debug, and runs more reliably; problem diagnosis is also easier so that problems can be identified and corrected more quickly and easily. Response time will be reduced by using dedicated hardware rather than operating in a multi-programming environment.

The use of multiple small machines will enable system capacity to be extended in small and more manageable steps, and where applicable, to correspond to distributed organizational patterns. By decentralizing processing, telecommunications costs will be reduced in many cases.

With few exceptions, today's networks and data bases are of a highly centralized structure with virtually all processing power concentrated in one large central installation. This arrangement frequently makes inefficient use of costly communication lines and absorbs considerable resources in the control and handling of communications. There is a tendency to use expensive general purpose mainframe computing hardware for tasks which could be handled more cost-effectively by mini-computers. Historically, highly centralized systems have generally been easier to design, operate and control than more decentralized systems. However, they are by no means always the most satisfactory systems from the point of view of the user. There are many applications which, at least in principle, can be processed locally; local processing can substantially reduce long distance data traffic and associated costs and, at the same time, provide much needed local autonomy and flexibility. Centralized processing may still be desirable and viable within local, regional, and organizational boundaries, and may still be required for certain applications such as the manipulation of very large data bases.

While local processing and distributed types of networks may not have been very practicable in the past, this is no longer the case now. Local processing of certain applications is

beginning to be viable and may even be less expensive than centralized processing. For example, there is a growing number of mini-computer based library circulation systems on the market[1] and most observers expect to see increasingly widespread introduction of this type of system.

Local processing is a particular form of "distributed processing" which in its most centralized form may employ multiple computers located in a single room. OCLC Inc. has made substantial progress in implementing the latter type of distributed processing and employs multiple mainframe and mini-computers at a single installation.

Distributed processing can be implemented without employing a distributed data base. OCLC Inc., for instance, for many years operated a single on-line data base with a distributed processing computer system, i.e. a single computer system employing multiple computers. The "distributed data base" concept is a similar type of concept to the "distributed processing" concept in that it covers a spectrum of alternatives ranging from relatively centralized implementations through progressively more decentralized implementations. At one end of the distributed data base spectrum, a master data base may ineract with small slave local sub-bases on separate machines at a single site. At the other end of the spectrum, multiple copies of a single master data base may be in simultaneous use at geographically distant locations with arrangements to keep the different copies of the data base synchronized. In between these two possibilities are many others including, for instance, situations where a central location maintains a full data base directory, dictionary and general schema but only a local portion of the data base, while local nodes have only local directories, dictionaries and schemas and corresponding local portions of the data base.

Distributed data base systems offer the same potential advantages listed earlier as potential general advantages of distributed systems: rapid response; reduced telecommunications costs; decreased impact of failures; better correspondence to organizational patterns; and greater local autonomy and flexibility. However, there are also considerable potential disadvantages and problems. Data storage costs are normally higher and there are a series of potential problems associated with technical complexity and difficulties of administrative control.

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1. See for example: Automated library circulation systems 1977-78 by Paula Dranov. White Plains, New York, Knowledge Industry Publications Inc., 1977. LC card number 77-7382.

Potential technical problems include those of maintaining data consistency within the data base; synchronizing updates effectively; failure detection; data deadlock; and avoidance of the situation in which the data base becomes partitioned into self-sufficient subsets which become inconsistent. Administrative problems include those of administration in any decentralized system even within a single jurisdiction: how to maintain control and avoid the system disintegrating into a series of autonomous independent sub-systems. Administrative problems are enormously increased where multiple jurisdictions are involved.

The current state of the art with regard to the distribution of on-line bibliographic data bases is illustrated by UTLAS. UTLAS employs mainframe hardware to operate its central on-line bibliographic data bases. Using the CIRC system a library can maintain a local circulation and catalogue access file which, in catalogue record terms, is effectively a copy (normally in a shorter record format) of the master file which the library maintains on the UTLAS mainframe installation. For catalogue record purposes the mainframe base is the master base, and the mini-computer base is a (not always completely up-to-date) slave offering decentralized access. An updating cycle transfers data from the mainframe base to the mini-computer base, and a new catalogue record created in the mainframe base waits for the updating cycle prior to its replication in the mini-computer base.

There are many problems to be overcome before any multi-jurisdictional distributed national bibliographic data base scheme can be realized. Apart from these problems there are also forces which are working in the direction of greater centralization of data bases and systems. Bibliographic resource (e.g. MARC) and authority files are growing rapidly and are most easily maintained and updated on large, relatively centralized systems. In addition, as pointed out in section 3.2, as more and more libraries in the future implement relatively independent individual automation arrangements, the need for central location index files is likely to increase.

The general technical and administrative considerations outlined in this section confirm the applications-oriented analysis summarized in section 3.2. Decentralization offers many potential advantages but is no panacea. The most effective system will normally employ a mixture of centralization and decentralization. As a general rule, access is much easier to decentralize than system management and control, especially in a multi-jurisdictional environment. As technical, economic, organizational, political and social

circumstances change through time, the optimum balance of centralization and decentralization will also likely change. The most practical approach to the problem of what to centralize and what to decentralize is to proceed in a continuing series of practical steps, each justified on its own merits and tested experimentally in advance. In this way functions, resources and operations which are best decentralized can be progressively decentralized. Likewise, functions, resources and operations which are best centralized can be progressively centralized. Functions, resources and operations which, for the time being, appear to be administered on an adequately centralized/decentralized basis can be maintained on this basis. No balance of centralization/decentralization can be expected to remain optimum over long periods of time, especially when technical, economic, organizational, political and social circumstances are changing rapidly: this balance will require regular review on a continuing basis.

In the context of NLC data base planning, a centralized and necessarily somewhat limited NLC bibliographic data base operated on a single installation may be considered as a feasible step towards a more decentralized and comprehensive Canadian national bibliographic data base. Experiments with other centres (e.g. UTLAS and its user groups) should be used to determine whether and what more decentralized arrangements are currently viable. These arrangements should then be implemented. As developments proceed, further experiments, experience in the use of DOBIS in a multi-library environment, and development of packet-switched data network links may show that a progressively greater degree of decentralization is feasible and cost effective. New arrangements shown to be desirable, feasible and cost effective should be implemented.

2.7 The library network of the 1980's

In the light of the technological developments described in this chapter, a general pattern for the development of a Canadian nationwide library network can be projected.

It is expected that regional centres will be repositories of large bibliographic data bases; these regional centres will also serve as communications concentrators for messages among local libraries and serve as service centres for libraries not accessing computer facilities. Telecommunications facilities such as a combination of regular telephone lines, value-added network utilities such as Datapac, Infoswitch, etc., and microwave and satellite transmission will be used

to interconnect these regional centres thereby creating a nationwide network. The National Library of Canada will act as a principal node in this nationwide network and serve as liaison with network and information systems of the United States and Europe.

Minicomputers will be used extensively for library technical processing. On an interactive basis, libraries will access regional data bases directly or request that data be copied to a local computer for local processing. Because of the rapidly decreasing cost of computer storage, it will be possible for medium and large-sized libraries to maintain large disk files locally. The type of bibliographic data contained in these files will vary according to the needs of a library's staff and patrons; in many cases, the full bibliographic record and its location information will reside at the regional centres and will be accessed as required by individual libraries. Circulation transactions will also be run on a minicomputer.

As more on-line bibliographic data bases with holdings information are developed, procedures will be developed to facilitate links to abstracting and indexing services. This will result in significant enhancements to current information services offered by libraries.

These projections are similar to those described in Library networks, 1978/79.[1]

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1. Library networks, 1978/79, by Susan K. Martin. White Plains, New York, Knowledge Industry Publications, Inc., pp. 107-109.

3. MANAGEMENT AND FUNDING OF LIBRARY NETWORKING IN CANADA

3.1 Introduction

The management and funding of library and information services in Canada involve many separate authorities and jurisdictions, including all levels of government (federal, provincial and local) and the private sector. For networking it is essential to be able to identify the jurisdictions and mandates of the principal authorities concerned; the actual and potential sources of funding for R & D; and finally the existing or evolving mechanisms for consultation and cooperation. All of these aspects have been examined in the three substudies B1, B2, and B3.

Substudy B2 describes the principal federal and provincial government agencies whose mandates bear on library and information network development in Canada. Substudy B1 examines the funding sources for network related research and development. Substudy B3 examines the formal mechanisms for consultation and cooperation, i.e., committees, councils, associations, etc. Finally, the substudies make a number of specific suggestions and recommendations based on their findings.

3.2 Role of government agencies: federal

Six federal government agencies are identified as having legal mandates bearing directly or indirectly on some aspects of library and information services network development. Three of these, namely, the National Library of Canada, the National Research Council and the Public Archives each have sizeable operating programs. The services provided and facilities maintained by these programs are of particular relevance to nationwide networking. The remaining three agencies, namely, the Department of the Secretary of State, Ministry of State for Science and Technology (MOSST) and the Science Council of Canada are oriented towards policy development rather than provision of operational services.

In comparison with the mandates of the other five federal government agencies, the mandate of the National Library of Canada is far the most comprehensive with respect to library and information services networking in Canada. The principal officially stated responsibilities of the National Librarian, in addition to managing and directing the National Library, are to:

- "facilitate the use of the library resources of the country by the government and the people of Canada;"[1]

- provide general direction to the National Research Council concerning NRC's responsibility "to develop in concert with existing information organizations, a national scientific and technical information system to encompass the natural sciences and engineering";[2] and finally to

- "coordinate the library services of departments, branches and agencies of the Government of Canada".[3]

The responsibility of the Ministry of State for Science and Technology (MOSST) is to formulate and develop policies in relation to the activities of the Government of Canada that affect the development and application of science and technology. The ministry is also required to assist other departments and agencies in the formulation and development of advice to the government with regard to the optimum investment in science and technology, the most satisfactory organization of scientific activities, and the most effective participation in international scientific affairs.

In discharging its broad mandate, MOSST is assisted by two crown corporations, namely, the Science Council of Canada and the National Research Council of Canada, both of which report to the minister in charge of MOSST. The orientation of the

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1. Estimates for the fiscal year ending March 31, 1978, Ottawa, Minister of Supply and Services Canada, 1977, pp.24-88.

   N.B. This is the "objective" for which the budget estimates for NLC are voted by Parliament. The "sub-objectives are stated as:

   "To maintain a centralized bank of bibliographic information in all fields for reference and research purposes", and

   "To coordinate the resources of the National Library, which are primarily in the fields of the social sciences, the arts and the humanities, with those of other research libraries."

2. Memorandum for Associate Committee on Scientific Information on the cabinet decision for dissemination for scientific and technical information, 19 December 1969.

3. Revised Statutes of Canada 1970. National Library Act, 1969, C.N-11, Section 7(1).

Science Council is exclusively towards science policy development while that of the National Research Council is towards implementation of scientific and technical programs resulting from government policy.

The Science Council has the mandate to assess, in a comprehensive manner, Canada's scientific and technological resources, requirements and potentialities, and to make recommendations thereon to the Minister of State for Science and Technology.

One of the NRC's major areas of responsibility is the provision of scientific and technical information services for the benefit of all Canadians. The Canada Institute for Scientific and Technical Information (CISTI), administered by NRC and incorporating the former National Science Library, is the principal vehicle for NRC's scientific and technical information dissemination programs.

The Department of the Secretary of State has the mandate to formulate and develop policies and programs for the achievement of national arts and cultural objectives.

The mandate of the Public Archives of Canada is to acquire and preserve historic material relating to the history of Canada and to provide a records management and microfilming advisory service to government departments and agencies.

3.3 Role of government agencies: provincial

The great majority of libraries and library collections in Canada fall within the jurisdiction of provincial and local authorities. Obviously, no nationwide library network of any substance can be developed without provincial cooperation.

There is usually more than one authority involved in the provision of library and information services within one province. Services operated by the different authorities are rarely coordinated. As far as Substudy B3 was able to determine, no province, with the sole exception of Alberta, has a single interdepartmental body concerned with the province-wide coordination of library and information services. The result is that at least 27 provincial agencies are involved in the coordination of library services in the provinces. More than 27 provincial agencies may be involved, since Substudy B3 was not able to establish whether a number of provinces/territories have agencies with mandates to coordinate the libraries of their respective provincial/territorial governments. The figure of 27 does not include

agencies concerned with the operation of individual libraries or library systems.

The situation is summarized in Table 6. With such a large number of authorities or agencies the prospects for nationwide coordination are rather doubtful. Clearly, some mechanism must be devised to assist communication and cooperation between provinces if an effective nationwide library and information network is to become a reality.

3.4 Funding for research and development

The principal source of funding for national information and library network related research and development (R&D) is the Government of Canada through its departments and agencies. If a R & D proposal lies within the mission of a federal government department or agency, then that particular department/agency can formally sponsor and fund the proposal through its own budget allocations. Similarly, a proposal lying within the mission of several federal government departments or agencies can be sponsored and funded by several departments/agencies.

This method of funding R & D projects is greatly facilitated by the government's "Unsolicited Proposals Funding Program" which seeks to bridge the gap between the slow budgetary process of government departments and the need for prompt response to worthwhile R & D proposals. The "Unsolicited Proposals Funding Program" was initiated to assist the federal government policy of "contracting-out" to the private sector R & D supporting the scientific and technical missions of federal government departments and agencies.

If a proposal is accepted, 65%-75% of the initial funding will normally be provided by Supply and Services Canada which administers the "Unsolicited Proposals Funding Program". The sponsoring department will have to provide the remainder from its own budget. The Unsolicited Proposals funds are essentially "bridge funds", bridging the gap between the date the funds are needed and the date when they can be supplied through normal departmental budget procedures.

These funds are provided for a period of up to 12 months, the absolute upper limit being 18 months. If longer term funding is required, this must be arranged by the sponsoring department which normally has to contribute 25-30% of the initial funding. Normally, the R & D proposals must be within a $10,000-$500,000 range, although there are means of handling larger proposals.

TABLE 5: PROVINCIAL AGENCIES WITH MANDATES TO COORDINATE PROVINCE-WIDE LIBRARY PROGRAMS, 1977

Province	Agencies coordinating: Academic Libraries[1]	Public Libraries	P./T. Govt.[2] Libraries	Total number of agencies
Alberta	1. Department of Advanced Education 2. Alberta Education	Alberta Culture	Legislative Library	4
British Columbia	Ministry of Education	Library Development Commission	-	2
Manitoba	1. Dept. of Continuing Education & Manpower 2. Dept. of Education	Dept. of Tourism, Recreation & Cultural Affairs	-	3
New Brunswick	Dept. of Education	Dept. of Youth, Recreation & Cultural Resources	-	2
Newfoundland	Dept. of Education	Dept. of Tourism	-	2
Northwest Territories	Dept. of Education	Dept. of Natural & Cultural Affairs	-	2
Nova Scotia	Dept. of Education	Dept. of Education	Dept. of Education	1
Ontario	1. Ministry of Colleges and Universities 2. Ministry of Education	Ministry of Culture and Recreation	-	3
Prince Edward Island	Dept. of Education	Dept. of Education	-	1
Québec	Ministère de L'Éducation	Min. des Affaires culturelles	-	2
Saskatchewan	1. Dept. of Continuing Education 2. Dept. of Education	Minister in Charge of Libraries	Minister in Charge of Libraries	3
Yukon	Ministry of Education	Dept. of Tourism, Conservation and Information Services	-	2
			TOTAL	27

1 Includes university, college, and school libraries.

2 P./T. means Provincial/Territory; the table is not complete since time has not permitted investigation to establish whether a number of provinces/territories have agencies with mandates to coordinate the libraries of their respective provincial/territorial governments.

The granting councils, namely, the Natural Sciences and Engineering Research Council (NSERC) and the Social Sciences and Humanities Research Council (SSHRC) are relatively minor sources of funds for network related R & D. "Free basic research", which the Councils tend to support, has a pure research rather than a development orientation. No significant sources of funding for network R & D were identified in the private sector.

The following table summarizes the available data on funding during the fiscal year, 1976/77. Funding now channelled through NSERC and SSHRC was at that time administered by NRC and the Canada Council.

TABLE 6 : GOVERNMENT OF CANADA FUNDING FOR EXTERNAL R & D PROJECTS, 1976/77[1]

Name of funding agency/department of federal government	Area of R & D funding: Inform. Science & library network (a)	All areas of R & D (b)	Column (a) as a percent of column (b)
All federal departments & agencies except those below	Not available	$75,600,000	-
Supply and Services Canada	$1,180,000	$13,700,000	8%
Medical Research Council	-	$40,100,000	-
National Research Council of Canada	$ 230,000	$67,200,000	0.3%
Canada Council	$ 20,000	$11,000,000	0.2%

1. Amounts announced in the year 1976/77. Some of these amounts would be spent beyond the end of the 1976/77 fiscal year. In-house R & D expenditures are not included in these figures. For details of the sources and methodology used in compiling these figures, reference should be made to the report of substudy B1.

In theory, the federal funding arrangements outlined above appear capable of providing needed funds for R & D in the area of information and library networking. In practice, there is some doubt as to whether all worthwhile and needed network R & D projects can meet all the criteria for federal funding. For instance, criteria such as scientific merit and technical merit need to be met, also some agencies, e.g provincial agencies, may not qualify. The only sure way to establish the adequacy of existing funding arrangements is to make these arrangements known to organizations in a position to make use of them and to monitor needs and applications for funds over a period of one year. If improved arrangements are required, these can then be proposed on the basis of the monitoring results.

3.5 Mechanisms for consultation

Nationwide networking in library and information services calls for extensive consultation arrangements in view of the many jurisdictions and authorities involved. Such arrangements must, of necessity, be at several levels corresponding to levels of program implementation, namely, national, federal (inter-agency), provincial (inter-agency), inter-provincial, etc.

Substudy B3 has reviewed the existing situation and found that while a number of arrangements exist for consultation within restricted jursdictions (e.g. single agency, single province), there is no existing forum which could provide adequate consultation concerning nationwide multi-agency information and library network programs.

At the federal government level, the National Library Advisory Board (NLAB) has a broad mandate to advise and assist in the development of relations between NLC and other libraries and library and educational associations and institutions. The Advisory Board for Scientific and Technological Information (ABSTI) provides a national focus for liaison and network initiatives, but its mandate is restricted to scientific and technical information services. The Council of Federal Libraries mandate does not extend beyond the libraries of the federal government agencies.

There is no single inter-departmental committee or mechanism at the senior policy level which can coordinate federal government network planning and provide an interface with provincial and other jurisdictions.

At the provincial government level, the recently formed Alberta Interdepartmental Liaison Group on Library Development is the only committee identified in the country which is concerned with library planning on a province-wide basis.

There are no interprovincial government committees active in the library networking area.

Professional associations provide for discussion of network issues among librarians and information specialists, but their conferences, seminars, etc., are usually restricted in scope and concerned with, for instance: specific library types, specific subject areas, geographic regions, technical processing services, etc. The Canadian Library Association, for example, has made a number of formal presentations to the federal government on issues of Canada-wide importance.

The most active groups in library network development are the university collectivities in Ontario, Quebec, British Columbia and the Atlantic Provinces, but their projects are being developed independently to serve specific user groups.

3.6 Conclusions

The most important conclusions emerging from three substudies may be summarized briefly as follows:

With the mandate "to facilitate the use of the library resources of the country by the government and the people of Canada",[1] the National Library of Canada is the federal government agency with the broadest and most comprehensive mandate to initiate and support national and federal schemes for information and library network development. This mandate is reinforced by the federal cabinet directive that the National Research Council of Canada "under the general direction of the National Librarian develop in concert with existing information organizations a national scientific and technical information system to encompass the natural sciences and engineering". Further reinforcement is provided by the National Librarian's mandate under the National Library Act to "coordinate the library services of departments, branches and agencies of the Government of Canada". While other agencies have specific responsibilities for specific subject areas and aspects, it is clear that general responsibility lies with the National Librarian.

An interesting precedent for a nationwide library network exists in the nationwide museums network. In 1972, the National Museums of Canada implemented a Canadian nationwide

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1. Estimates for the fiscal year ending March 31, 1978. Ottawa, Minister of Supply and Services Canada, 1977; pp.24-84.

museum network as part of a "National Museum Policy". This network consists of 25 Associate Museums and 29 National Exhibition Centres within five regions (Pacific, Prairie, Ontario, Quebec, and Atlantic). Five financial assistance programs were initiated with an annual allotment of $8.6 million.[1] The published estimates for these programs in 1977-78 mounted to $8.3 million.[2] The appendix to the report of Substudy B3 provides an eight page description of relevant National Museums of Canada network and committee arrangements, including a brief description of the national museum policy.

With regard to funding, existing federal government mechanisms provide for the funding of research and development lying within the missions of federal departments and agencies and for free basic research. The fact that the information and library community has not made significant use of the existing mechanisms does not necessarily prove that the mechanisms themselves are inadequate. The real test is whether worthwhile and needed projects can be funded following proper application for funds. It is recommended that the appropriate existing federal government funding arrangements should be brought to the attention of organizations in a position to use them, and that applications for funds and their results should be monitored over a period of one year. If improved arrangements are required, these can then be proposed on the basis of the monitoring results.

With regard to consultation arrangements, new arrangements will be required as broad-based federal and national library and information networking programs are developed. The programs and their associated consultation arrangements should be implemented together. No new arrangements are called for at this time because the first priority is to agree on the general scope of programs to be mounted. Following this agreement, appropriate consultation arrangements should be implemented in conjunction with the programs requiring their support.

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1. The National Museums of Canada museum assistance programmes: general information. Ottawa, National Museums of Canada, n.d., 8p. Figure from p.5.

2. Estimates for the fiscal year ending March 31, 1978. Ottawa, Minister of Supply and Services Canada, 1977. p. 24-96.

4. COMPUTERIZED LIBRARY NETWORKING IN CANADA: VIEWS FROM THE COMMUNITY

4.1 Introduction

This section is based principally on the report of Substudy C1 which is a compilation of important briefs submitted to the National Library of Canada in connection with two exercises noted below.

In 1976, NLC began a major review of its objectives, services and its internal organization. Organizations concerned with library services in all parts of Canada were formally invited to submit their views and suggestions for this review.

During the same year and at the time of initiating the Canadian Computerized Bibliographic Centre Study (CCBCS), the National Librarian invited major organizations and some prominent individuals in the field of library and information services in Canada to comment on the terms of reference and the general approach of the CCBCS.

By the end of 1977, a sizeable number of briefs and submissions had been received by the National Librarian. These briefs included some very specific recommendations for action by the National Library as well as a number of interesting observations and comments.

The recommendations listed below are supported by two or more submissions. In the list of observations and comments presented in subsection 5.3, only those are included which tend either to support the recommendations or complement them in some way.

4.2 External recommendations

The National Library of Canada should:

a) provide leadership in planning and coordinating bibliographic services and resources in Canada. (7 submissions)[1]

b) work towards the establishment of a nationwide bibliographic network consisting of a national computerized bibliographic centre and a number of regional or provincial bibliographic centres. (8 submissions)[2]

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1. AUCC, CAIS, CARL, CLA(3), Université de Montréal.

2. Alberta Culture(2), CAIS, CLA(3), HRC, Université de Montréal.

c) maintain and develop the Canadian union catalogue on-line. (6 submissions)[1]

d) provide national interlibrary loan and location service through a computerized library and information network. (6 submissions)[2]

e) provide automated catalogue service through a computerized library and information network. (5 submissions)[3]

f) encourage the development of on-line services in the social sciences and humanities for uniquely Canadian materials. (5 submissions)[4]

g) support and itself participate in efforts to define a national information policy for Canada. (4 submissions)[5]

h) provide national standards for library and information services. (3 submissions)[6]

i) encourage national cooperation and networking by recognizing, supporting, and working together with such centres as CISTI, BNQ, and UTLAS. (3 submissions)[7]

j) contract out for library consultation and automation services (as appropriate) to meet developmental needs and service goals. (2 submissions)[8]

k) produce an on-line union list of serials in the social sciences and humanities. (2 submissions)[9]

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1. Alberta Culture(2), ACMC, AUCC, CLA, HRC.

2. Alberta Culture, ACMC, CAIS, CALL, CLA, HRC.

3. Alberta Culture(2), ACMC, CLA(2).

4. Alberta Culture, ACMC, CAIS, CLA, HRC.

5. CAIS, CLA(3).

6. Alberta Culture, CAIS, CLA.

7. Alberta Culture, CLA(2).

8. CAIS, CLA.

9. ACMC, HRC.

4.3 External observations

Many separate jurisdictions and authorities are involved in the development, operation and funding of computerized library and information systems in Canada.

There is a widespread expectation that the National Library of Canada, because of its national level responsibilities noted in section 4, must assume an active leadership role in promoting and coordinating library and information systems development in the country.

There is also a growing awareness that a nationwide computerized library network will have to be planned and implemented within a wider nationwide information and library system, and that a coordinated, and long term development strategy is needed in this connection.

The following selection of observations and comments highlights some of the problems and issues raised in the externally submitted briefs and in Substudy A2.

a) Role of the National Library

(i) "The National Library is the only institution among Canadian libraries with statutory national responsibilities and it must therefore assume a leadership role in resolving jurisdictional problems". (CLA Brief)

(ii) "... It is most important that the National Library should not isolate itself. On the contrary, it must assume a role of constructive leadership through frequent and frank exchanges of views, through positive relations with all libraries and through real action within the framework of federal-provincial relations". (CALL Brief)

(iii) "CLA suggests that the role of NLC in encouraging the development of cooperative interlibrary schemes that will lead to the establishment of computerized library networks should be one of highest NLC priorities". (CLA Brief)

(iv) "CLA strongly suggests that the National Library Act be strengthened to support this broadened mandate of the promotion of interlibrary cooperation and the resulting coordination of service. In changing the Act the National Librarian would be empowered to promote this role of leadership and would have access to funding for these purposes." (CLA Ad Hoc Committee)

(v) "... the National Library should increase support for consultation and coordination at the interprovincial level. The National Library should also be prepared to contract for projects which will support inter-provincial cooperation. The Canadian Library Association recommends that the necessary federal funds be made available to the National Library for this purpose." (CLA Brief)

(vi) "With NL supplied or funded expertise, (outside) organizations (in Canada) could go ahead with their automation plans and would do so in a manner that would be compatible with a later network and at a net saving to the Canadian tax payer, since software and possibly hardware might be shared with NL or other organizations." (Substudy A2)

b) A national reference and information network in parallel with bibliographic and resource networks

(i) "We recommend long-term development of a national reference and information service (network) in parallel with bibliographic and resource networks ..." (CLA Brief)

(ii) "In the future the most important functions of a computerized bibliographic centre may be to provide bibliographic information as a necessary step in locating specific information (facts, data, etc.) to satisfy a user's information need.

From this it follows that two types of network probably should exist: one to provide information regarding the existence of an item and the other to provide the item itself or the information contained therein ..." (CLA Technical Services Committee Brief)

c) Need for practical cooperative schemes and projects; NLC/CISTI cooperation

(i) "NLC should further develop its cooperation with CISTI and work out and implement practical schemes of cooperation with major computerized library automation systems in Canada, particularly the University of Toronto Library Automation Systems and the Bibliothèque nationale du Québec." (CLA Ad Hoc Committee)

(ii) "Rightly or wrongly, many people in the library community view the Federal Government as one amorphous mass rather than as a collection of highly independent agencies and departments. It would be an undoubted benefit to many potential members of a Canadian bibliographic network if they were able to view and use the NL and CISTI nodes as one". (Substudy A2)

(iii) "Many of the unanswered questions raised in this report cannot be answered no matter how much they are 'studied'. The only way in which NL can find out many of the things it needs to know to become a ... major force and influence in bibliographic networking in Canada is to embark upon an active program of action. This implies both performing pilot projects in various areas themselves as well as funding and encouraging projects by outsiders. Undoubtedly this approach results in 'wasted' money: money spent on projects which 'fail' according to the goals originally set. Nonetheless, the information and hands-on experience which derive from this approach are almost always of great value ... The main requirement is for a shift ... away from ... 'study it to the nth degree so that we can be use of success' towards ... 'try it out and see what we learn'." (Substudy A2)

CANADIAN COMPUTERIZED BIBLIOGRAPHIC CENTRE STUDY:

BACKGROUND, TERMS OF REFERENCE AND PERSONNEL

BACKGROUND

An Informal seminar on bibliographic centres in a Canadian library network was held at the National Library of Canada on May 5 and 6, 1975. In his letters of invitation to the seminar, the National Librarian explained its background and purpose in the following terms:

> "Present developments in Canada appear to lead in the direction of a computerized library network in which a number of regional bibliographic centres and a national centre cooperate to provide various services, for instance union catalogue and cataloguing support services.
>
> I am holding an initial informal seminar to bring together groups known to be active in bibliographic centre planning and development. The seminar will provide a forum for exchange of information on plans and developments, for discussion of plans and developments with a view to clarifying the envisaged roles of regional and national centres, and for identification of areas of possible cooperation in bibliographic centre development."

The seminar was chaired by the National Librarian and attended by delegates from 19 organizations*. The proceedings of the seminar

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* These organizations were: Alberta Department of Culture, Youth and Recreation; Atlantic Provinces Library Association Committee on a Bibliographic and Storage Centre for the Atlantic Provinces; Association of Atlantic Universities Librarians' Committee; Association pour l'avancement des sciences et des techniques de la documentation; Bibliothèque nationale du Québec; British Columbia Library Development Commission; Canada Institute for Scientific and Technical Information; Canadian Library Association; Canadian Union Catalogue Task Group; Comité Directeur du Projet CIDBEQ (Centre d'informatique documentaire des bibliothèques d'enseignement du Québec); Directors of Ontario Regional Library Systems; Manitoba Department of Tourism, Recreation and Cultural Affairs; National Library of Canada; National Research Council of Canada; Nova Scotia Provincial Library; Ontario Universities' Library Cooperative System; Saskatchewan Provincial Library; Sous-comité des bibliothèques, Conférence des recteurs et des principaux des universités du Québec; and University of Toronto Library.

have been published[1] in English and French. A major recommendation on of the seminar was that

> "the National Library of Canada should undertake studies as soon as possible to detail the present bibliographic network development situation across Canada, and to show the main likely future interrelationships between bibliographic centres at provincial/regional and national levels. These studies might desirably lead to the production of guidelines to assist development of a cooperative national union catalogue EDP network."

Following the seminar the National Library devoted considerable time, effort and consultation to obtaining agreement on the precise nature and terms of reference of the study that the delegates and their organizations wished to see undertaken. This process entailed a country-wide set of visits and was not completed until mid-February 1976. Practical work on the study commenced at that time; this work takes into account and seeks to build upon the work of the Canadian Union Catalogue Task Group. The latter Group, composed principally of Chief Librarians from across Canada, presented its final report[2] in May 1976 following nearly four years of work. The report outlines a number of basic concepts highly relevant to the present study, for instance, the basic concept of a Canadian national bibliographic network. The report also contains a number of recommendations highly pertinent to study work; these include:

> "#2 That the National Library of Canada establish and coordinate a Canadian union catalogue system, in cooperation with provincial/regional library systems.
>
> #3 That this system consist of a national bibliographic centre at the National Library of Canada and a number of provincial/regional bibliographic centres.
>
> #4 That these provincial/regional bibliographic centres, in as much as they are part of the Canadian union catalogue system, have the capacity to record and provide information about holdings as agreed with and arranged by the National Library.

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1. Proceedings of the informal seminar on bibliographic centres in a Canadian library network, Ottawa, National Library of Canada, May 5 & 6, 1975. Microfiche, price $5.

2. Canadian Union Catalogue Task Group final report. Ottawa, National Library of Canada, 1976, 86p.

#5 That these provincial/regional bibliographic centres may also provide various cataloguing support services and other services as agreed and arranged within the provinces/regions concerned.

#18 That the National Library of Canada and the Canada Institute for Scientific and Technical Information work with the appropriate agencies in defining the computer communications requirements of a fully developed bibliographic network."

TERMS OF REFERENCE

To review the present situation concerning computerized bibliographic centres in Canada and to report with specific relevance to the following:

- the plans of major existing and emerging computerized bibliographic centres and associated service organizations in Canada, for instance: UTLAS (University of Toronto Library Automation Systems); Ontario Universities' Library Cooperative System (OULCS) including UNICAT/TELECAT; National Library of Canada; National Research Council of Canada and emerging centres elsewhere, e.g. in the Atlantic Provinces.

- relevant computerized library network services available or planned to be available in Canada, for instance, the services of Ohio College Library Center (OCLC), and Blackwell North America Inc.

- the most effective means of promoting desirable Canadian computerized library network development, including the development of a cooperative national union catalogue/national bibliographic data base system making use of a network of national and regional computerized bibliographic centres and their computer-readable data bases.

RECOMMENDATIONS OF THE SUBSTUDIES

1. GENERAL DESCRIPTION OF APPENDIX B

This appendix lists the recommendations and conclusions of the substudies of the Canadian Computerized Bibliographic Centre Study, with the exception of substudies A1, A3 and C1. The recommendations and conclusions are quoted verbatim but with a coordinated number scheme designed to give this appendix a coherent structure.

Substudy A1 is descriptive and has no formal recommendations. Substudy A3 was preparatory to Substudy A2 and its recommendations were carried forward and incorporated in the report of Substudy A2. Recommendations appearing in externally submitted briefs and compiled in the report of Substudy C1 are summarized in section 5 of the present document and therefore are not repeated in this appendix.

2. RECOMMENDATIONS OF SUBSTUDY A2: "NATIONAL LOCATION SERVICE PLANNING IN AN EVOLVING CANADIAN COMPUTERIZED LIBRARY NETWORK"

The report of this substudy has attempted to forecast cost, trends, opportunities, and potential problems in a number of areas related to design and operation of bibliographic systems and networks. In addition, it has tried to paint an outline picture of an initial Canadian network as it will likely emerge in 1980-1981. The report has failed to present the design of an 'ideal' network toward which National Library's energies could be directed, mainly because too many variables exist which are, at this point, unpredictable.

Each chapter of the report, in discussing one particular aspect of system or network design, does raise questions or highlight problems and information gaps, each of which can be solved or answered by conducting further studies. The objective and need for each of these further studies or activities comprise the thrust of most of the recommendations which follow:

The recommendations are grouped into four general areas:

* Those recommendations which will enhance National Library's leadership role in the development of bibliographic networks. ("A" series recommendations - section 2.1 below).

* Those recommendations which will result in the production of more and better figures where such are presently not available. ("B" series recommendations - section 2.2 below)

* Those recommendations which will better prepare National Library for DOBIS' implementation not so much as NL's internal library management system but more as the prime node of a Canadian network. ("C" series recommendations - section 2.3 below)

* Miscellaneous recommendations which do not fit any of the above categories. ("D" series recommendations - section 2.4 below)

The sections listing the recommendations of the substudy are followed by a further section (section 2.5) which summarizes the conclusions of the substudy with respect to bibliographic centre data base interrelationships in a Canadian location service network.

Prior to reviewing the recommendations, it is worth noting three general observations. These are not, of themselves, recommendations, but they do set the stage for some of the recommendations listed later. The observations are as follows:

i) Many of the unanswered questions raised in this report cannot be answered no matter how much they are "studied". The only way in which NL can find out many of the things it needs to know to become a (the?) major force and influence in bibliographic networking in Canada, is to embark upon an active program of action. This implies both performing pilot projects in various areas themselves as well as funding and encouraging projects by oûtsiders.

   Undoubtedly, this approach results in "wasted" money: money spent on projects which "fail" according to the goals originally set. Nonetheless, the information and hands-on experiencé which derive from this approach are almost always of great value.

Specific examples are hard to pinpoint, but would be irrelevant in any case. The main requirement is for a shift in attitude, away from one of "study it to the nth degree so that we can be sure of success" toward one of "try it out and see what we learn".

Surely the Union Catalogue falls into this catetory. Of all NL's activities, it seems to have been studied and analyzed to

the (n+1)th degree, and yet there are still many unanswered questions. When "frozen", should it be published? Would people use it? Would the fiche be readable? (Why not publish some of it now? Why not find out if the fiche is readable?). Similarly: what access methods should be provided? Should in-WATS lines be used? What would they cost? Would people use a regional centre? How? (Could not one in-WATS line be installed for a while to find out how and how much it is used and what it would cost? Could not a model "regional centre" be tried in, for example, Toronto?).

An indirect benefit of the try-it-out approach would be an enhancement of National Library's image, an improvement in its appearance as a vital and active organization rather than as a passive bureaucracy. In network development, the name of the game is cooperation and the more NL is seen to be doing and trying, the more visibility it will have and the more cooperation it is likely to receive.

ii) National Library already cooperates with Library of Congress in terms of exchange of expertise, exchanging cataloguing data, and so forth. However, there appears to be little harmonization of plans concerning the system aspect of developing automated national union catalogues and planning and developing bibliographic networks. While much bibliographic auto- mation in the US is several years ahead of Canada, these two areas are not; they are progressing on roughly the same schedule. Since both NL and LC are inventing similar wheels on similar schedules, there should be a greater degree of technological information interchange. Some past efforts to this end have apparently met with only limited success; NL should persevere.

Traditionally Canada has "borrowed" technology from the US in the field of bibliographic automation (viz: all hardware, some software, standards and protocols, MARC format, etc.) and hence has been the poor cousin in the relationship. Active cooperation and continuous swapping of experiences would allow more concern for Canadian priorities.

iii) Finally, it would not only contribute to future interconnection compatibility, it would be a major PR coup for National Library if it were to offer expertise to outside organizations in Canada who wish to automate but who lack sufficient budget and/or skilled personnel. Of particular note at present are the Nova Scotia Provincial Union Catalogue and the Saskatchewan Provincial Union Catalogue.

With NL-supplied or funded expertise, these organizations could go ahead with their automation plans and would do so in a manner that would be compatible with a later network and at a net saving to the Canadian taxpayer, since software and possibly hardware might be shared with NL or other organizations.

The previous three "comments" have not been worded as recommendations only because they do not logically flow from the Technical Substudy's findings. That does not mean that they are any the less important.

2.1 Recommendations which will enhance NLC's leadership role in network development. ("A" series of recommendations)

* Recommendation A1

  The Networks Office should be given the resources necessary to enable National Library to take a more active role in bibliographic system coordination in Canada. Specifically, such coordination should include the provision of funds, expertise, and/or facilities to planned or evolving centres.

  The amount and nature of these resources will need to be determined by National Library management in cooperation with representatives of some of the evolutionary centres.

* Recommendation A2

  In order that National Library should be able to relate DOBIS implementation to its role as a network node, and so that the Networks Office may better fulfil its network-coordination role, the Networks Office should be provided with a greater complement of technical expertise.

  It is, therefore, recommended that one member of the Networks Office be assigned to upgrade his or her technical skills, particularly in the areas of data communications and EDP systems networking.

* Recommendation A3

Recognizing that various National Library personnel are currently involved in setting and/or liaising and cooperating in groups which define protocols, NL should formally set up a Bibliographic Network Protocol Coordination group. Logically, this "group" should reside in the Networks Office and should - initially at any rate - consist of one person part-time. Later, as networking activities in Canada increased, its size might increase to two or perhaps three people. The group's mandate would be to:

- coordinate all NL representation on non-Canadian network standards and protocols development groups;
- ensure adequate Canadian representation on all such foreign groups;
- ensure that NL's own (DOBIS) protocols were compatible with existing, planned, and expected protocols;
- liaise with other Canadian centres in development of common protocols;
- publish and generally publicize NL's own protocol-related decisions and activities.

* Recommendation A4

Rightly or wrongly, many people in the library community view the federal government as one amorphous mass rather than as a collection of highly independent agencies and departments. It would be an undoubted benefit to many potential members of a Canadian bibliographic network if they were able to view and use the NL and CISTI nodes as one.

It is, therefore, recommended that when most hardware for DOBIS has been selected, NL (if possible in co-operation with CISTI) should study the costs, benefits, and technical and jurisdictional problems of providing single-point access to a Federal Government Centre, rather than having separate network nodes for NL and CISTI.

* Recommendation A5

Finally, National Library should adopt the policy of using pilot projects to help define opportunities and problems.

Given that DOBIS will be operational soon, planning should commence immediately for the development of on-line links to UTLAS and LC.

2.2 Recommendations designed to result in better background facts and figures. ("B" series of recommendations)

* Recommendation B1

National Library should commission a limited-effort long-term study to gather more and better statistics than presently exist on:

- what union catalogues exist in Canada;
- measurements of those union catalogues (size, users, uses, etc.);
- communication/message traffic generated or likely to be generated as a result of union catalogue use.

"Union catalogues" should be defined as loosely as possible. The study should take of the order of three to six man-months spread over the next two to three years while DOBIS is becoming operational.

The objectives of the study are:

- to identify sources of data and ultimate end users of union catalogue-related aspects of a Canadian bibliographic network;
- to produce accurate data on potential data communications traffic in such a network.

This information (data, users, communications) would allow NL to make informed decisions as to the best possible design of an "ultimate" network of greatest benefit to Canadians as a whole. This "ultimate" network, although almost certainly never achievable, would be the model against which evolution of the real network would be measured.

* Recommendation B2

Based upon:

(a) the contents of chapter 11,

(b) review of the data forecasts - particularly relating to holdings data - by NL personnel, and

(c) an analysis of what appears realistically achievable,

NL should decide what percentage of location requests, satisfiable by on-line interrogation, represents an acceptable figure.

The report has assumed 50 percent. This means that half of all requests would be satisfied through on-line interrogation and the other half would not. Of the latter, three-fifths would be satisfied by interrogating the manual system and two-fifths would remain unanswered.

"Acceptable" needs definition in NL's own context. A suggested definition is "with no increase in present staff". (Perhaps, too, it should be decided whether "percentage of requests" or "percentage of effort" should be the determining factor. They are not proportional.)

* Recommendation B3

NL should determine which factors can be measured and used to decide which requests are most likely to be satisfied by the automated system.

An obvious factor - used in chapter 11 for illustrative purposes - is age. The chapter shows that were the data base to contain all accession reports received during the previous ten years, then half of all requests would be satisfied - with no further criteria being used. Typically, additional factors could be:

- language
- country of publication
- source of the request
- nature of the request

* Recommendation B4

NL should attempt to develop a selection algorithm which will enable it to select and include records in the data base such that the expected percentage of requests will be satisfied.

Successful achievement of the foregoing three recommended actions will allow NL to determine what should be in the initial data base. It is highly likely that a data base made up only of records which are "spun off" other systems (in other words, such as has been used in chapter 11), would not satisfy a useful percentage of requests. To raise the percentage one could start now and capture all accession reports in machine-readable form. That, however, might not be practical from budgetary points of view and would likely not be the best solution.

* Recommendation B5

During the next 18 months, NL should perform a cost/benefit study to determine if and how the existing Canadian Union Catalogue should be published.

The foregoing seven recommendations all suggest that "NL should ..." without specifying specifically who should do the work. The writer firmly believes that all the various studies proposed should be performed by NL personnel, since all require subject-matter expertise unlikely to reside in outside people or organizations. Coordination of the studies should almost certainly be a function of the Networks Office, being the only component of NL which has no specific interest in one aspect of the final system.

2.3 Recommendations to enhance DOBIS' role as a network node. ("C" series of recommendations)

* Recommendation C1

DOBIS' role as a major (or the major) node in a Canadian bibliographic network should be formally recognized by National Library. The implications of this should be identified and documented.

* Recommendation C2

Following from the above, a development and implementation plan and schedule for DOBIS should be drawn up which:

(a) recognizes the varying (and sometimes conflicting) needs of different component organizations within National Library;

(b) contains a clear statement of activities and events necessary for all target dates to be met;

(c) identifies the duties and responsibilities of different people and organizations to perform those activities;

(d) identifies necessary inputs from and interactions with organizations outside NL.

* Recommedation C3

One member of the DOBIS development/implementation team should be given responsibility for ensuring closest possible compliance with recognized standard communications protocols, particularly in a packet-switched environment. The responsibility should include:

- monitoring developments in IBM's SNA, and attempting to ensure 'future compatibility' of DOBIS where this is feasible;

- monitoring developments in CCITT X.29/TCTS SNAP protocols;

- keeping current in costs, techniques, protocols, and technologies of dedicated line communications and packet-switched communications, so that the two can be constantly evaluated in terms of their effects upon DOBIS' costs and effectiveness;

- advising other DOBIS team managers and members of his/her findings and recommendations on a regular basis.

* Recommendation C4

If the DOBIS team presently includes one person whose sole responsibility is in data communications, then that person should:

(a) be allotted up to 20 percent of his/her time exclusively for "current awareness training", and

(b) make himself/herself available on an occasional basis to the Networks Office to provide that office with technical expertise over and above that resident in the office.

If such a person does not presently exist in the DOBIS team, then one existing team member should be so designated.

* Recommendation C5

NL should take appropriate action to ensure that the initial DOBIS/CANUC data base will be adequately augmented with needed additional records.

"Appropriate action" probably involves cooperative work with UTLAS. There are two obvious possibilities:

(i) NL acquire a terminal to UTLAS and uses it to enter accession reports which meet the selection criteria developed.

(ii) NL and UTLAS jointly work to extract records from the UTLAS data base in a form ultimately usable by DOBIS.

It is understood that tentative steps have already been taken toward the second of these.

* Recommendation C6

Initial access to the automated CANUC should be left in its existing fashion (telex, mail, telephone, etc.), unless users specifically request alternatives. Alternatives so requested should be evaluated on their merit. When the system has been operational for a year users should be polled to determine their needs and/or desires for alternative access methods.

* Recommendation C7

The manual Canadian union catalogue system should be frozen once the automated system has been shown to operate in a production environment for three consecutive months with no major errors and with an acceptable degree of success.

2.4 Miscellaneous recommendations. ("D" series of recommendations)

* Recommendation D1

DOBIS developers assign 5 man-days on a low priority during the next 6 months to identify, document, and logically isolate those DOBIS file components which will most likely benefit from being operated on fast-access storage devices when the latter becomes economically, technologically, and practically feasible to use.

* Recommendation D2

As a low priority, DOBIS developers should draw up a contingency plan for developing dumb terminal access to DOBIS for the purpose of making on-line location requests and dummy on-line accession reports (with unsatisfied requests and all reports being spooled to a separate system).

This software should not actually be developed yet, since "dumb" terminals will be cheaper and less dumb in 2 to 3 years than they are now, and since the requirement for this kind of access to the data base is not proven and can only be proved or disproved when DOBIS is up and running.

2.5 Summary of conclusions relating to bibliographic centre data base interrelationships in a Canadian location service network

* Complexity of the centralization/decentralization problem

  Even the highly simplified analysis presented in this substudy illustrates the complexity of determining what is the optimum national location service pattern at a given point in time. Myriad options have not even been outlined, and the optimum pattern is shifting through time as technology and circumstances change. Further, location service cannot realistically be treated in isolation from the interlibrary lending process it is designed to support, and bibliographic data used for location purposes duplicates to a considerable extent the bibliographic data required for information retrieval, bibliographic control and library technical processing. The latter fact implies that location service data will usually be held in bibliographic data bases supporting multiple functions where location searching is only one function.

* National location service models

  There are severe limitations to the modelling approach as a means of determining how much decentralization is feasible at a given point in time. In this respect the findings of substudy A2 (summarized in subsection 3C) are confirmed. However, the models considered point decisively towards the initial superiority of a model (Model 1) in which the National Location Facility maintains a National Location Index rather than a model (Model 2) in which the National Location Facility maintains only a Multi-Regional Location Index including locations for libraries whose data is not held by a Multi-Regional Location Facility.

  The choice between the models is less clear cut in the medium to longer term. The balance of advantages in favour of Model 1 will be less marked following the advent of widespread NLF/MRLF/RLF/Local library computer-to-computer communication. Depending upon factors such as the need to publish national union catalogues and lists, the balance of advantages may tilt in favour of Model 2 at that time. However, the balance of advantages may subsequently tilt back again (or, if it

stayed in favour of Model 1, tilt more strongly) in favour of Model 1 when (as is likely) many libraries implement and maintain relatively independent individual automation arrangements. Libraries in the latter situation may not record their location data in RLIs or MRLIs.

* National Location Facility development

A realistic approach is to continue to implement a relatively centralized computerized National Location Facility with as comprehensive a National Location Index as circumstances permit, while taking opportunities that present themselves to experiment with arrangements leading in the direction of a more decentralized pattern. Arrangements which pilot projects show to be feasible and cost effective can be implemented. In this way aspects of the system which it is desirable to decentralize can be decentralized in a series of practical steps each justified on its own merits and tested on a pilot basis. This evolutionary approach is needed not only to bypass modelling difficulties but also to cope with potential organizational (e.g. contractual) problems and to avoid destabilizing interlibrary loan patterns in an unpredictable and counter-productive manner. There is a danger that sudden changes in location service arrangements may work to raise excessively the interlibrary loan demands on given libraries resulting in their raising interlibrary loan charges and/or adopting other load shedding arrangements, with a possible ripple effect through the system.

* More detailed findings of CCBCS Substudy A2

The following findings are confirmed. While the mainstream of NLC location service development should follow the pragmatic course outlined above, a number of more detailed findings and conclusions are that:

(i) NLC should coordinate its location service planning as closely as possible with CISTI planning of related services, and should consult closely with LC.

(ii) NLC should contribute towards at least the federal aspects of regional bibliographic centre planning, for example, Saskatchewan Provincial Union Catalogue and Nova Scotia Provincial Union Catalogue planning.

(iii) NLC should promote the development of computer/communication protocols suitable for intercommunication between Canadian computerized bibliographic centres.

(iv) Planning exercises or studies need to be mounted to bring together missing traffic statistics; to produce a more fully worked out NLC data base strategy; to determine if and how Canadian Union Catalogue data should be published; to elaborate the role of NLC/CISTI DOBIS system and data base in the Canadian bibliographic network.

3. RECOMMENDATIONS OF SUBSTUDY B1:
"FUNDING FOR CANADIAN INFORMATION AND LIBRARY NETWORK DEVELOPMENT"

3.1 Information on existing federal funding channels should be made available to organizations in a position to use them, thereby ensuring that worthwhile projects can receive federal funding support.

3.2 An NLC/CISTI program for the monitoring of information and library network applications made to Supply and Services Canada and the granting councils should be established for an initial period of one year. This would involve monitoring and analyzing the criteria used for the acceptance and rejection of proposals received by SSC and the granting councils. Subject to the results of this program, improved funding arrangements could be proposed, implemented, and promoted.

3.3 A register of grants awarded to information and library network projects should be maintained by NLC/CISTI. This would facilitate the dissemination of project information and results to interested groups.

3.4 NLC/CISTI should contribute towards the costs of extra-provincial and extra-regional aspects within provincial and regional studies and projects concerned with information and library network development.

3.5 NLC/CISTI should facilitate nationwide liaison and communication by sponsoring or contributing to appropriate meetings, workshops, and conferences at regional, federal, and national levels. Networking topics, including, for example, the interchange of bibliographic centre plans or information services plans, could be discussed.

3.6 NLC/CISTI should, as far as resources permit, sponsor worthwhile proposals submitted under the SSC unsolicited proposal procedure; where appropriate, they should also contract-out R & D work.

4. CONCLUSIONS OF SUBSTUDY B2:
"LIBRARY NETWORKING IN CANADA: THE PRINCIPAL FEDERAL AND PROVINCIAL AGENCIES CONCERNED"

To have the best chance of lasting success, any scheme for promoting library cooperation in Canada must take account of the separate authorities concerned, must respect their areas of jurisdiction, and must ensure that they are involved, informed and/or consulted as appropriate.

At the national level, the National Librarian of Canada has the most general and comprehensive mandates relevant to library and information network development. The broad mandate "To facilitate the use of the library resources of the country by the Government and the people of Canada" is reinforced by several more specific mandates. These mandates appear sufficient to allow the National Librarian to (as appropriate) present, sponsor or endorse proposals to the Federal Treasury Board to obtain resources for federal contributions to networking projects, studies and developments meeting the approval and support of the Canadian library and information community.

At the provincial/territorial level, 27 agencies have been identified as having mandates to coordinate library programs within their respective provinces/territories. Twenty-seven is a minimum figure for the number of provincial/territorial agencies which would need to be involved, informed and/or consulted in any truly nationwide scheme of library cooperation. This figure does not include all agencies concerned with provincial/territorial government libraries; and, of course, private sector libraries would need to be dealt with on an individual basis.

Any truly national scheme of library cooperation will involve dialogue and cooperation between the federal and provincial/territorial agencies concerned. Twenty-seven is too great a number of provincial/territorial agencies to interact and cooperate effectively. For effective dialogue and interaction at the national level it will be necessary to find a way of reducing the number of agencies which have to interact simultaneously and directly with one another.

The position would be greatly improved if each province/territory had some form of interdepartmental coordinating committee concerned with libraries, for example, similar to the Alberta Interdepartmental Liaison Group on Library Development. This Group includes representatives of Alberta Culture, Alberta Department of Advanced Education and Manpower, and Alberta Education. The Group chairperson is, therefore, in an excellent position to pass on information relating to public, university, college, and school libraries. If similar committees existed in other provinces/territories (and if the committees also included persons representing agencies coordinating provincial/territorial government libraries) a maximum of 13 persons could handle the bulk of general library liaison work in Canada: 12 provincial/territorial chairpersons and one federal government representative. The number of provincial/territorial committees could probably, in practice, be less than one per province/territory. The Atlantic Provinces, for instance, might well choose to have some form of joint committee arrangement.

Arrangements of this type would greatly assist coordination relating to library matters at both the provincial/territorial level, and between this level of government and the federal government. These arrangements would greatly assist the discussion, agreement, implementation and operation of nationwide library cooperative schemes.

5. CONCLUSIONS OF SUBSTUDY B3: "LIBRARY NETWORKING IN CANADA: PRINCIPAL RELEVANT COMMITTEES AND ASSOCIATIONS"

5.1 The successful implementation of an effective Canadian information and library network depends upon the cooperation and participation of all sectors of the Canadian information community. This will be facilitated by effective coordination at the federal and national levels, adequate consultation arrangements at all levels, and by improved communication and dissemination of information on networking topics.

5.2 Arrangements to provide additional necessary consultation should be implemented in conjunction with their associated groups or levels of network program rather than as separate arrangements divorced from these groups or levels of network program. For example, new national level programs and consultation arrangements should be implemented together rather than separately.

5.3 Programs at the individual federal agency level should employ existing agency consultation arrangements. For NLC programs the National Library Advisory Board (NLAB), and for CISTI programs the National Research Council's Advisory Board for Scientific and Technological Information (ABSTI), should exercise their mandates to play a more active role in network development.

5.4 Any proposed shared NLC/CISTI programs may require the support of a joint NLAB/ABSTI body. Networking concerns might be addressed at joint meetings of the two bodies, or by a network advisory committee appointed by and representative of the two boards.

5.5 Programs involving multiple federal agencies (e.g. other federal government libraries), will require a broader based coordinating mechanism. It should utilize the existing Council of Federal Libraries, but may also require participation and support at the senior federal policy level.

5.6 National level programs will require the support of a forum where policy, priorities and planning for the nationwide information system can be addressed. This substudy indicates that no suitable forum for this purpose exists at present. Rather than create a special body solely for this purpose, it may be preferable to form a committee which could perform a dual role. Such a committee might:

(a) provide a suitable forum for the development of the nationwide information system encompassing all services involved in the provision of information for all sectors of the community and for all categories of users;

(b) provide a focus for international information activities.

One choice might be a Canadian National Committee for the Unesco General Information Program, similar to the existing US and British committees. It would represent and promote Canadian needs, interests and views with respect to the Unesco General Information Program, as well as to other international information activities. The creation of such a committee would be consistent with an ABSTI proposal for a federal mechanism to coordinate Canadian programs with respect to international intergovernmental information activities.

Whatever its structure, a national forum should include representation from appropriate federal government agencies, provincial governments and professional associations. It should utilize existing consultative and coordinating mechanisms, and reflect provincial and regional as well as national concerns.

5.7 At the provincial level, governments should be encouraged to form interdepartmental committees, or sponsor consultation arrangements which would provide a provincial focus for information and library network activities. The Alberta Interdepartmental Liaison Group on Library Development is one example of such a committee. These groups would facilitate provincial network planning, and play an important role in representing provincial views and needs at the federal and national levels.

5.8 At the level of individual federal network programs, there will be need for ad hoc advisory committees for specific networking studies and projects (e.g. programs relating to data bases, national lending/copying/storage facilities, etc.). These committees should include representatives from the various agencies, jurisdictions and groups concerned with or affected by the programs.

LIST OF ABBREVIATIONS

AAU/BNA	Association of Atlantic Universities/Blackwell North America Project
ABSTI	Advisory Board for Scientific and Technological Information
AC	Alberta Culture
ACMC	Association of Canadian Medical Colleges
AUCC	Association of Universities and Colleges in Canada
BALLOTS	Stanford University Library System: "Bibliographic Automation of Large Library Operations using a Time Sharing System"; subsequently renamed Research Libraries Information Network (RLIN)
BCUC	British Columbia Union Catalogue Project
BNA	Blackwell North America, Inc.
BNQ	Bibliothèque nationale du Québec
BRS	Bibliographic Retrieval Services, Inc.
CALL	Canadian Association of Law Libraries
CAN/OLE	Canadian On-line Enquiry System
CCBCS	Canadian Computerized Bibliographic Centre Study
CCBD	Centennial College Bibliocentre Division
CCITT	Comité consultatif international télégraphique et téléphonique: The International Telegraph and Telephone Consultative Committee
CISTI	Canada Institute for Scientific and Technical Information
CLA	Canadian Library Association
COM	Computer Output Microform
DOBIS	Dortmunder Bibliothekssystem
HRC	Humanities Research Council

IRF	Information Retrieval Facility
LC	Library of Congress
LIS	Lockheed Information Systems
LNUG	Library Network User Group; in U.S. usage "Bibliographic service center"
LPF	Library Processing Facility; in U.S. usage "Bibliographic utility"
MTLB	Metropolitan Toronto Library Board
NLAB	National Library Advisory Board
NLC	National Library of Canada
NRC	National Research Council of Canada
NRLS	Niagara Regional Library System
NSERC	Natural Sciences and Engineering Research Council
OCLC	OCLC Inc., formerly Ohio College Library Center
QL	QL Systems Ltd.
OULCS	Ontario Universities' Library Cooperative System
R & D	Research and Development
SDC	Systems Development Cooperation Search Services/ Infomart
SDI	Selective Dissemination of Information
SNAP	Standard Network Access Protocol
SSC	Supply and Services Canada
SSHRC	Social Sciences and Humanities Research Council
TRC/NCRLS	Tri-Regional Catalogue/North Central Regional Library System
UTLAS	University of Toronto Library Automation Systems
WLN	Washington Library Network

GLOSSARY

1. INTRODUCTION

The vocabulary of library networking used in this document conforms generally to definitions adopted in the network planning paper recently issued by the Library of Congress.[1] This appendix lists only those terms used in the present document which are either absent or given a significantly different meaning in the LC planning paper.

The appendix is structured to bring conceptually related terms together in three major groups. These groups are titled: "network centres" (Section 3); "data bases" (Section 4); and "networks and systems" (Section 5). Terms in each group are individually defined. For ease of reference an alphabetic index is also provided in the next section.

2. ALPHABETIC INDEX TO TERMS

Each term is followed by the number of the paragraph in which the term is defined:

Bibliographic data base 4.2.3
Bibliographic network 5.2.1
Communications network 5.2.8
Computer network 5.2.9
Computer networking 5.2.10
Computerized bibliographic centre 3.2.1
Computerized library network 5.2.12
Data base 4.2.1
Distributed data base 4.2.2
Distributed processing 5.2.11
Information network 5.2.4
Information Retrieval Facility (IRF) 3.2.2
Library network 5.2.3
Library Network User Group (LNUG) 3.2.4
Library Processing Facility (LPF) 3.2.3
Multi-Regional Location Facility (MRLF) 3.2.6

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1. A glossary of library networking. Prepared by Dataflow systems for the Network Development Office, Library of Congress, Washington, D.C. 1978. 34 pages. (Network Planning paper #2. ISSN: 0160-9742).

Multi-Regional Location Index (MRLI). 4.2.7
National bibliographic data base) 4.2.5
National Location Facility (NLF) 3.2.7
National Location Index (NLI) 4.2.8
Nationwide information and library network 5.2.5
Nationwide information and library system 5.2.6
Nationwide information system 5.2.7
On-line bibliographic data base 4.2.4
Regional Location Facility (RLF) 3.2.5
Regional Location Index (RLI) 4.2.6
Resource network 5.2.2

3. NETWORK CENTRES

3.1 General

CCBCS work necessitated a definition of "Computerized Bibliographic Centre". This was defined as a broad term encompassing three subordinate terms: Information Retrieval Facility, Library Processing Facility, Library Network User Group. These terms appear first in the arrangement of terms in this section.

CCBCS terms of reference also called for more specialized work relating to national location service. In this context it was necessary to define a number of more specialized terms, including Regional Location Facility, Multi-Regional Location Facility, and National Location Facility. The latter more specialized terms appear last in the arrangement of terms below.

3.2 Types of centres

3.2.1 Computerized bibliographic centre

An organization offering to a number of libraries or similar organizations computer-based support for technical processing and/or information service operations. The LC Network Development Office glossary provides no equivalent term.

3.2.2 Information Retrieval Facility (IRF)

A centre operating one or more computers to provide citation retrieval or information retrieval services to more than one organization from a number of data bases. Citation retrieval is typically the retrieval of references to journal articles, but abstracts associated with these references may also be retrieved. Information retrieval implies a greater scope of searching and retrieval including, for example, the searching and retrieval of full texts, and/or of numerical and representational data. QL Systems Limited is an example of an IRF.

3.2.3 Library Processing Facility (LPF)

A centre that operates one or more computers to support one or more library technical processing operations for libraries of more than one institution. Library technical processing operations include cataloguing, circulation, interlibrary borrowing and lending, acquisition and serials control. The University of Toronto Library Automation System (UTLAS) is an example of a LPF. The nearest LC Network Development Office glossary equivalent term is "bibliographic utility".

3.2.4 Library Network User Group (LNUG)

A formally constituted group of libraries using the services of one or more LPFs for one or more common purposes. The group is formed by a formal agreement amongst the members, normally including some form of contribution to the group's finances. Ontario Universities' Library Cooperative System (OULCS) is an example of a LNUG. The nearest LC Network Development Office glossary equivalent term is "bibliographic service center". The latter term appears to be a synonym.

3.2.5 Regional Location Facility (RLF)

An organization maintaining and offering services from a Regional Location Index (RLI). The UNICAT/TELECAT project administered by the Ontario Universities' Library Cooperative System in cooperation with the Conference of Rectors and Principals of Quebec Universities is an example of a RLF. Operating as a RLF is only one specialized facet of the operations of UNICAT/TELECAT.

3.2.6 Multi-Regional Location Facility (MRLF)

An organization maintaining and offering services from a Multi-Regional Location Index (MRLI). UTLAS will be a MRLF when it has implemented its REFCATSS service in respect of more than one Regional Location Index (RLI). Implementing this service and becoming a MRLF will add another specialized facet to a multi-facetted organization: UTLAS will continue to be a Library Processing Facility (LPF).

3.2.7 National Location Facility (NLF)

An organization maintaining and offering services from a National Location Index (NLI). For most of the past three decades NLC and CISTI have cooperated to maintain a mostly manual NLI.

4. DATA BASES

4.1 General

General discussion on network centres entails the use of the term 'data base' and a number of subordinate terms. More specific discussion on national location service calls for the introduction of additional more specialized terms such as national location index, multi-regional location index, and regional location index. The arrangement of the definitions given below commences with terms of the greatest generality; more specialized terms appear later in the list.

4.2 Types of data bases

4.2.1 Data base

A sizeable collection of numeric and/or non-numeric computer-readable data organized for use. This is a broad term encompassing the narrow concepts of "bibliographic data base" and "data bank". Data banks are non-bibliographic data bases which contain numeric, representational (e.g. chemical structures), or other non-bibliographic (e.g. audio-visual) data.

4.2.2 Distributed data base

A data base maintained on-line on two or more separate computers with commonly held data elements, with arrangements to maintain synchronicity between all the copies of these separately located, commonly held data elements.

4.2.3 Bibliographic data base

A data base containing data concerning library materials. These materials include monographs, serials, theses, maps, music, audio-visual materials. This list is not exhaustive and may, for instance, be extended to cover manuscripts, unpublished and semi-published materials. The data concerning library materials may exist at different levels of detail, for instance: full text; abstract plus full cataloguing record; short citation plus holdings.

4.2.4 On-line bibliographic data base

A bibliographic data base that can be accessed in an on-line mode. Where an index is maintained on-line to records which are off-line, the on-line index may in certain circumstances be considered in its own right as an on-line bibliographic data base. An example of such a situation is where the on-line index will support certain transactions (e.g. interlibrary loan) while the fuller version of the data base is required only for other applications (e.g. cataloguing).

4.2.5 National bibliographic data base

A bibliographic data base which is sufficiently comprehensive in some regard to warrant the adjective "national". Sufficiently comprehensive may relate to a number of different aspects, for instance: the coverage of bibliographic works in the country's library collections, the coverage of computer-readable bibliographic records in the data bases of the country, the coverage of locations of bibliographic works in the country's library collections, the coverage of locations of computer-readable bibliographic records in the data bases of the country.

4.2.6 Regional Location Index (RLI)

A single data base or coordinated set of data bases which locate the holdings of libraries within a single region. The organization maintaining and offering services from a RLI is a Regional Location Facility.

4.2.7 Multi-Regional Location Index (MRLI)

A single data base or coordinated set of data bases locating the holdings of libraries within multiple regions. The organization maintaining and offering services from a MRLI is a Multi-Regional Location Facility.

4.2.8 National Location Index (NLI)

A single data base or a coordinated set of data bases which locate the holdings of major Canadian collections in all regions of Canada. Some form of nationally agreed scheme determines the comprehensiveness of the index.

5. NETWORKS AND SYSTEMS

5.1 General

In this section, general terminology (terms 5.2.1 - 5.2.7) required for CCBCS work precedes more specialized terms (terms 5.2.8 - 5.2.12) required for treatment of more technical aspects of networking.

5.2 Types of network

5.2.1 Bibliographic network

A formal cooperative arrangement in which two or more organizations engage in the shared creation, maintenance, or use of bibliographic files and/or bibliographic data bases, or in the provision of access to these files and/or data bases. The files and/or data bases may serve one or more of several

different functions, for instance, bibliographic searching (such as literature citation, retrieval), bibliographic verification, document location, and library technical processing (e.g. shared cataloguing).[1]

5.2.2 Resource network

A formal cooperative arrangement in which two or more libraries provide access to library materials.[1]

5.2.3 Library network

Two or more libraries engaged in resource sharing through formal or contractual arrangements for some common objectives. Resource sharing may take the form of one or more of the following:

(a) shared use of materials

(b) shared use of data bases

(c) shared use of library processing services and the computer facilities, software and telecommunication facilities required to provide these services.

5.2.4 Information network

Two or more organizations engaged in resource sharing through formal or contractual arrangements for some common objectives involving the provision and use of information services. This term overlaps to some degree the term library network in cases where a library network involves the provision and use of information services. An information network is primarily concerned with the provision and use of information services, and may not, in given cases, include libraries as participants.

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1. The concepts of a Canadian bibliographic network and a Canadian resource network are generally indicated in the Canadian Union Catalogue Task Group final report, Ottawa, National Library of Canada, 1976, pp.11-53.

5.2.5 Nationwide information and library network

A broad term encompassing "library networks" and "information networks". Resource sharing extends beyond local and regional boundaries and involves relevant organizations throughout the nation.

5.2.6 Nationwide information and library system

The complex of library and information agencies and their users within national boundaries. This is a broader term than nationwide information and library network in that it includes libraries and information agencies not engaged in any formal resource sharing arrangements. It is a narrower term than nationwide information system which includes the activities of many organizations not normally classified as library and information agencies. Examples of these organizations are those engaged in the physical processes of the recording and distribution of information, e.g. printing; book wholesaling and retailing; film and record production; electronic and conventional (e.g. mail) communication. "System" does not imply an ideal system: the present pattern is considered to be the present "system".

5.2.7 Nationwide information system

A very broad term that connotes all the resources, processes, services and activities involved in the provision of information for all sectors of the nation and for all categories of user. "System" does not imply an ideal pattern but the existing complex of resources, services, agencies, information producers and information users.

5.2.8 Communications network

A set of locations or nodes interconnected by telecommunications channels, usually on a switched basis, for the express purpose of message/data communications. Communications networks are either "open" and shared by all users (e.g. telephone networks) or "closed" and privately leased from common carriers by a customer organization for its

own use. Communications networks may also perform a certain amount of processing with a view to delivering the message/data in the most expeditious, economical and error-free manner (e.g. in the case of packet-switched communications networks).

This definition is considerably narrower than that of the Canadian Union Catalogue Task Group final report (1976) in which a communications network was defined as "consisting of a delivery system for the actual transfer of items by such means as the postal service and inter-organizational delivery, and information transmission systems".

5.2.9 Computer network

"A computer communications system consisting of one or more terminals communicating with a single host computer system, which acts as the network control component through internal programming or perhaps through a front end processor. The terminals can be local (i.e. up to a couple of thousand feet away) or can be remote (i.e. connected through a common carrier, specialized carrier, or private communications links). The terminals can be "dumb" or intelligent. There is no limit to the processing capability included in a terminal, nor is there a limitation on the number of communications lines serviced by the host system or on the number of terminals serviced on a multi-drop line. Remote concentrators can be used to efficiently use facilities. The chief characteristic of a network is the single, controlling host computer system, which may include multiple processors."[1]

5.2.10 Computer networking

"Interconnection of two or more computer networks. This definition carries with it the requirement for multiple controlling host computer systems. Each host controls its own network of dumb and/or intelligent terminals. The concept of networking permits a terminal nominally "controlled" by one host pro-

1. Datapro reports on data communications. Delran N.J., Datapro Research Corporation, 1978. Volume 1, January 1977, p. c04-100-106.

cessor to communicate directly with another host processor without the initial host being directly involved in the exchange. Normally, control of data forwarding from one node to another is performed by front end processors to relieve the host processor."[1]

5.2.11 Distributed processing

Computer processing employing multiple linked computers operating under common or shared control. A single logical set of processing functions is implemented across a number of computers so that each performs some part of the total processing required. Distributed processing may be effected either (a) horizontally when all the processors cooperate at the same level to perform a set of tasks, or (b) vertically when interconnected processors from a hierarchy sharing tasks in a structured way, each processor being to some degree controlled by the higher level member in the hierarchy.

5.2.12 Computerized library network

Two or more libraries engaged in resource sharing through formal or contractual arrangements for some common objectives. Resource sharing is facilitated and largely effected through the application of computer and communications technologies.

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1. Edited quotation from Datapro reports on data communications, op. cit. p. c04-100-106.

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